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## THE ELECTRIC MOTOR IN THE MACHINE SHOP.

If it were for nothing else, notwithstanding its many other advantages, the electric motor is well worth its place in the machine shop for the fact that it permits (as does no other form of prime mover) of a careful analysis and study of operating conditions of individual machines and operations by which it is possible to reduce to the absolute minimum the cost of working and to bring each machine and its attendant up to their maximum output.

In a recent paper entitled "Economical Features of Electric Motor Applications," read before a joint meeting of the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, Mr. Charles Robbins, of the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa., epitomized the results of investigations made possible by the use of electric drive in machine shops, as follows: (*a*) More flexible arrangement of tools; (*b*) greater facilities for handling materials at the tools; (*c*) greater facilities for handling materials between tools; (*d*) better facilities for obtaining auxiliary material, drawings, tools, etc.; (*e*) better facilities for making adjustment of the tools during machinery operation; (*f*) removal of causes of unsuspected or unavoidable delays due to small accidents and improper characteristics of the drive; (*g*) all lost time, due to whatever cause, is immediately brought to the attention of the superintendent, and an analysis of these losses will result in their elimination.

Mr. Robbins goes on to say: "With motor-driven tools this analysis can be made more conveniently and with less expense than can similar studies with any other form of machine-tool drive." By means of the graphic recording meter, the exact percentage of total working hours consumed in actual cutting on any particular job can be ascertained, all delays are clearly revealed, the rate of cutting can be checked, and a comparison of the work of many machines and operators can be made with a view to obtaining maximum economy. Incidentally, valuable data can be compiled as a guide to future designs of new tools or for converting existing tools to electric drive.

A few months ago Mr. B. R. Shover, in a most interesting paper read before the American Institute of Electrical Engineers and abstracted at length in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, showed similar advan-

tages of electric-motor drive in the steel mills at Gary, Ind. It may safely be said that the applications of electric drive to ordinary machine tools presents far less difficulties than to the much heavier machines used in iron and steel rolling mills. Already practically all of the most enterprising manufacturers have converted or are converting their machine shops to electric drive, and it goes without saying that other concerns who have not already done so will have to follow their lead in order to continue successfully in business. An interesting account of the electrification of the machine shops of the Schenectady shops of the General Electric Company is given on other pages of this issue.

## THE IMPORTANCE OF A PROPER RESERVE FUND.

It is a well-known fact among those who have watched carefully power-plant development in this country, that many central stations operate at a loss or at an insufficient profit after a few years of their existence. Some newly-established stations begin by paying too large a dividend to their stockholders. At a later period, when funds are required for replacement, it becomes necessary to borrow money. Therefore, the making of a proper allowance for maintenance funds is as important as for providing for running expenses.

This point was emphasized by Mr. William B. Jackson in a paper read before the joint meeting of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers on April 27 last, and which is abstracted, together with the discussion, in another part of this issue. Mr. Jackson calls attention to the fact that many plant managers do not realize to what circumstances the company will be reduced if proper maintenance allowance is not made.

There is quite naturally a desire on the part of the company officials to declare good dividends at first. The plant is new, the equipment is in excellent order, and but few repairs are necessary. It is, however, the money that is made at the beginning that will be needed later to make the inevitable repairs or replacements.

The best or perhaps the only way to foresee these expenditures and provide for them is to calculate depreciation on each part separately. An amount could be so fixed that by the time replacement becomes necessary on poles, lines or machinery, a sufficient sum for the purpose would have accumulated.

The development of the electrical industry has been so rapid that the newest piece of apparatus would probably not have a longer useful life than, say, twenty years. Often machinery becomes obsolete in ten years or even less. In one case mentioned it was necessary to shut down a turbine plant which was practically new, inasmuch as cheaper power was available from another and more recent plant. It is, of course, impossible to foresee such a condition as this, but it is possible and most advisable to figure carefully and logically the amount to be set aside to cover the depreciation on each part of a property.

## THE IMPORTANCE OF THE TEMPERATURE-COEFFICIENT OF COPPER.

The paper read at the recent meeting of the American Physical Society by Mr. J. H. Dellinger on "The Temperature-Coefficient of Copper," and abstracted in this issue is of considerable importance to the electrical engineering profession. This work demonstrates that while the coefficient varies in different specimens along with the chemical and mechanical variations, it remains proportional to the conductivity, which also varies. The values given in the table of the American Institute of Electrical Engineers are fair average values, but may not be very accurate for any particular case.

There are two uses of the temperature-coefficient which are of especial importance. One is in the purchase of copper, where the price is based upon conductivity and the measured conductivity must be reduced to the corresponding value for a specified temperature. An inaccuracy in the coefficient, whose value is usually assumed, may mean hundreds of dollars a year to a large consumer.

Another important use is in computing the hot resistance of apparatus or machinery from the measured cold resistance, or vice versa.

Mr. Dellinger's work shows that a measurement of the conductivity is sufficient to determine also the temperature-coefficient, so that if the former is measured the latter is at once known, and the proper value may be used. Also, in cases where the coefficient may be more easily measured than the conductivity, the value of the latter may be derived from the former.

## CONDENSING EQUIPMENT AND COOLING TOWERS.

With the advent of the steam turbine as a factor in electric generating stations, the question of more efficient condensing equipment is of paramount importance. With any condensing steam engine, the lower the vacuum the higher the efficiency, and especially is this so with the steam turbine. For instance, a 1,000-kilowatt steam turbine taking 22.0 pounds of steam per kilowatt-hour with a vacuum of 20.0 inches, takes 19.0 pounds of steam with a 25.5-inch vacuum, and 15.0 pounds with a vacuum of 29.25 inches. The problem is then to provide as high a vacuum as possible with a minimum of operating cost for the condenser equipment, for it is apparent that it is possible to increase the vacuum to such a degree that the cost of doing so would not be compensated for by the increased engine efficiency.

The selection of a suitable condenser and its auxiliary equipment is a special problem for each central station. There are many factors to be taken into consideration, chief

of which, apart from the existing installations, are the atmospheric and weather conditions, and the quality and quantity of water available for cooling purposes. Thus it is possible here to treat the problem only in a very general way.

The function of a condenser is to take away as much heat as possible from the exhaust steam at the minimum of expense, and, in reckoning this latter, the first cost of installation, the upkeep, and the operating expenses must all be taken into consideration, so as to secure the best return on the whole station investment. It is obvious that for the minimum pumping cost, the temperature of the water leaving the condenser should be as high as that of the entering steam. In practice, however, there is usually a differential of from fifteen to twenty-five degrees Fahrenheit in even the better-class central stations, although a temperature difference of from five to ten degrees, or less, has been obtained with certain types of condensers operating under favorable weather conditions.

In cases where the quantity of water is restricted in amount, or where the quality is inferior, so that it becomes necessary to use the condenser cooling water over and over again, it is advisable to install a cooling tower.

Cooling towers are of three kinds—those using natural draft, those operating under forced draft, and those using either natural or forced draft. The third class is convenient in cases where peak loads or abnormal humidity of the atmosphere makes it desirable to use forced draft when natural draft would prove insufficient or uneconomical.

Temperature and humidity are the climatic conditions which must be taken as of consequence in the design of a cooling tower. When the air entering the tower is already hot and moist it will obviously not take away as much heat from the water as when it is cold and dry, for the greater part of the heat extracted from the water goes to supply the latent heat of evaporation of enough water to saturate the air leaving the tower. If the air is very dry, its temperature does not really matter very much as the extraction of heat from the water in causing enough of the latter to evaporate to saturate the air may make the temperature of the water fall several degrees below that of the air.

The purpose of the cooling tower is to expose the hot water from the condenser to a large volume of air. This is effected by causing the water to trickle down over rough boards, wood blocks, tiles, galvanized wire screens, sectional lath mats, burlap curtains, or the like, against an upward current of air. The choice of these materials is determined by the cost and by the design of tower chosen. The actual design does not matter very much as long as free falling of the water is avoided, consistent with a sufficiently retarded descent of the water and a minimum obstruction of the air draft. In all cases the air and water must be brought into intimate contact and the air should leave the tower in as saturated a condition as possible. It is not necessary fully to inclose the tower on all sides, except when it is desired to use as much of the water over again as possible. When there is sufficient water available to make up for losses, a free circulation of prevailing air currents is often useful to aid the draft, when natural draft is used.

The prevailing type of cooling tower used in this country is the forced-draft tower, while in Europe the natural-draft tower is preferred. The preferable design for most cases is perhaps the mixed-draft type, in which natural draft is used under normal conditions, and an exhaust fan may be used to induce a forced draft when required. An interesting description of a natural-draft chimney-type cooling tower for a 7,000-kilowatt station appears on other pages of this issue, and may be taken as fairly typical of recent English practice.

## ELECTRICITY IN CHURCHES.

Many people who are otherwise enthusiastic on the subject of universalizing the applications of electricity may balk at its introduction into the church, not because electricity is not useful, hygienic or economical—these points are readily conceded—but because its ultra-modernity may seem in some way to be out of keeping with the venerable traditions of antiquity.

In some things, electricity has made encroachments on medieval church methods, and the ground it has gained it will hold. For instance, the old-fashioned churchwarden who used to toll the bell and then go round to the back of the organ to operate the wind bellows for this musical instrument is fast relinquishing these duties to the electric motor. For what is more convenient for the organist at any time to switch on the current from his bench for the organ-blowing motors, rather than take the chance of the blower man not being on the alert? And even in India the punkah is giving way to the silent electric fan for cooling and ventilating purposes. An instance of this occurs in the Bombay Cathedral.

The greatest field, however, for electricity in churches, is in the illumination. Here lies a great opportunity for the combination of a nice artistic and aesthetic sense in solving the lighting problems while paying a due regard to church traditions. By a judicious use of indirect systems of lighting, the "dim religious light" should easily be obtained where and when required, and prevailing styles of church architecture should afford scope for considerable ingenuity and effect along these lines. For altar lights, the electric "candle" should be in evidence, with its obvious advantage of requiring little or no attention except at prolonged intervals. In fact, the opportunities in church lighting for high-efficiency incandescent lamps, preferably perhaps of small candlepower, appear to be unbounded, and it is confidently to be expected that great developments will be made in the near future. The subject is earnestly recommended to the notice of the illuminating engineer.

### Programme of the St. Louis Convention of the National Electric Light Association.

Preparations are well under way for the twenty-fifth anniversary and thirty-third convention of the National Electric Light Association, which is to be held at St. Louis, Mo., from May 23 to 27. A programme giving the papers to be read has been arranged in part and distributed. The programme and also a list of the various committees with their chairmen follow:

The regular business will include President Frueauff's address; and very full and valuable reports by standing committees: "Public Policy," W. W. Freeman, chairman; "Securing New Members," H. H. Scott, chairman; "Progress," T. C. Martin, chairman; "Lamps," W. F. Wells, chairman; "Overhead Line Construction," Farley Osgood, chairman; "Protection From Lightning and Other Static Disturbances," B. E. Morrow, chairman; "Uniform Accounting," J. L. Bailey, chairman; "Grounding Secondaries," W. H. Blood, Jr., chairman; "Preservative Treatment of Poles and Crossarms," W. K. Vanderpoel, chairman; "Meters," G. A. Sawin, chairman; "Gas Engines," I. E. Moultrop, chairman; "Question Box," J. C. Parker, chairman; "Question Box Revision," P. Lupke and A. J. Campbell, chairmen; "Solicitors' Handbook," A. Williams, chairman; "Electrical Measurements and Values," A. E. Kennelly, chairman; "Terminology," W. H. Gardner, chairman; "National Conservation," D. Farrand, chairman; "Insurance," W. H. Blood, Jr., chairman.

The general and technical papers to be presented include the following: "Super-Specialization," by Paul Lupke; "Founding the Association," by Elmer A. Sperry; "Educating the Central Station Employe," by Prof. S. W. Ashe; "Periodic Lamp Renewals," by A. G. Strickrott; "Magnetite and Flaming Arcs versus Open and Inclosed Carbon Arcs for Street Illumination," (illustrated by lantern), by W. D'A. Ryan; "A New Form of Tungsten Lamp," by C. F. Scott; "Water Intake from the Mississippi River for Two Electric Generating Stations in St. Louis," by J. Hunter; "Decentralized Steam Plants," by R. D. DeWolf; "Space Economy of Turbo Generators," by Paul M. Lincoln; "Gas Engine Plants for Central Stations," by Nesbit Latta; "Feeder Regulators," by E. E. Lehr; "A New Departure in Distribution Construction Methods," by S. B. Way; "Direct Current Turbo Generators," by W. L. Waters; "Location of Faults in Underground Cables," by W. A. Durgin; "Interesting Points about Modern Transformers," by E. J. Reed; "Precautions When Using Instrument Transformers," by L. T. Robinson; "Comparison of European and American Switchboard Practice," by S. Q. Hayes; "The Oscillograph in Fuse Testing," by Alex. Maxwell; "Small Hydraulic Plant Design," by F. J. Howes; "Irrigation in Rural Communities," by H. Russell; "The Series Tungsten Lamp as a Factor in Street Lighting," by C. E. Stephens; "The Voltage Control of Generators and Feeder Systems," by F. W. Shackelford; "The High Efficiency Lamp," by S. E. Doane. A special address will be given on anniversary evening by Past-President Insull on "Twenty-Five Years of Central Station Commercial Development."

The Power Transmission Section with Mr. D. B. Rushmore as organizing chairman has not yet fully formulated its programme, but a general committee of some thirty well-known members is now at work. Among papers and addresses are the following: "The Public and the Water Powers"; Present Problems in Power Transmission," by H. W. Bucks; "Phenomena of Power Transmission at Highest Voltages," by Dr. C. P. Steinmetz; several important topical discussions are being arranged.

The programme of the Commercial Section includes the following papers: "Latitude in Commercialism," by Arthur S. Huey; "Residence Lighting," by H. J. Gille; "Central Station Advertising," by H. K. Mohr and C. W. Lee; "Electric Automobiles," by Hayden Eames; "Ornamental Street Lighting" (illustrated by lantern), by E. L. Elliott "Sales Department Organization," by T. I. Jones; "A Plan to Interest National Advertisers in Electrical Publicity," by Frank B. Rae, Jr.; "Industrial Lighting with Incandescent Lamps" (illustrated by lantern), by Messrs. J. M. Hoit, S. H. Hall and Paul Bauder; "Prompt Execution of Orders," by Clare N. Stannard. Several prominent men have promised to open the various discussions.

The Accounting Section will present several important papers and the Committee on Uniform Accounting will exhibit a series of nearly twenty large books embracing thousands of classified forms and blanks sent in by about 150 member companies. There will be papers on: "The Accounting Methods of the Detroit Edison Properties," by E. J. Bowers, and on "Storeroom Accounting," by R. F. Pack; as well as others on "Electrical Current Stock—How Calculated"; "Mechanical Office Appliances"; "Handling Customers' Line Orders"; "Voucher and Accounts Payable Record"; "Meter Records"; "Care and Handling of Customers' Accounts," by J. M. Mulvihill.

In addition to the exhibit above referred to, of the Committee on Uniform Accounting, there will also be special exhibits by the Meter and Question Box committees. It is also proposed to arrange an "experience meeting" for the score or more of company sections, at which section work will be discussed and data will be submitted as to the rules and regulations for the award of the gold medal presented by Past-President Henry L. Doherty for the best paper read before company sections during any year.

### Fourth Avenue Subway Funds.

The New York city Board of Estimate has authorized Comptroller Prendergast to issue $150,000 worth of corporate stock, so that the Public Service Commission can pay for extra work on the contract for the construction of the Fourth Avenue subway in Brooklyn. The matter of installing pipe line galleries in the subway was laid over.

### Twenty-Eighth Street Line Sale Put Off.

The foreclosure sale of the Twenty-eighth and Twenty-ninth Street Railroad Company, New York city, has been postponed until May 11. This action was taken at the request of the bondholders' committee, owing to the absence of Judge Mayer, counsel for the committee.

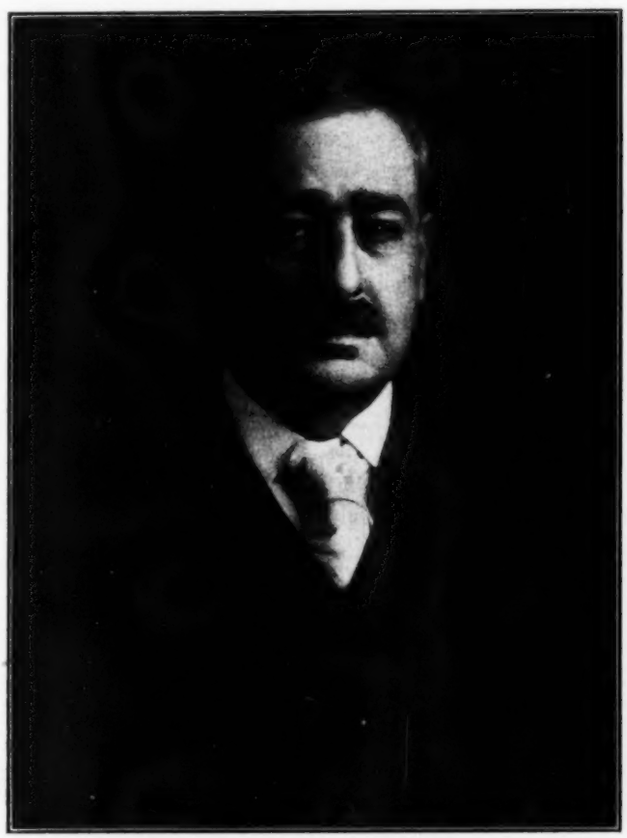
### Brennan Monorail in Alaska.

Exclusive rights to use the Brennan monorail car in Alaska have been granted to an American syndicate represented by J. E. Ballaine of Seattle and a firm of New York bankers. The syndicate has agreed to build one hundred miles of railway within one year following the completion of two cars, an order for the construction of which was given today.

### H. M. Byllesby.

Shortly after the opening of the present year the representatives of a large number of public-utility companies gathered in Chicago to do honor to their chief. The event was also the occasion of bringing together several of the country's greatest leaders in finance, industry and corporate management. Among the many nice things that were said to and about the central figure of the occasion we will take one short excerpt from the remarks made by Samuel Insull. This tells our little story about the subject of this sketch, and it is peculiarly apropos—being "praise from Sir Hubert," indeed. Said Mr. Insull:

"It is now nearly thirty years ago since the world was astonished, and the owners of gas securities were unnecessarily shocked, by the wonderful invention made by Mr. Edison when he perfected the incandescent lamp and gave to us his very wonderful distributing system, which we all of us have to use as much today as he had to at his New Jersey laboratory in Menlo Park, many years ago. It was my great privilege to be associated with him in the earliest commercial work that he undertook in New York City, and only a month or so after I had joined his forces, our honored host of this evening joined the engineering department of the old Edison parent company, which was the pioneer in the development of the incandescent lighting industry.



HENRY MANSON BYLLESBY,
President of H. M. Byllesby & Company, a Prominent Construction Genius.

"When we bear in mind what has been accomplished in the short time since the first central station was established in New York in 1882, and when we remember that the original money invested by the Edison Electric Illuminating Company of New York earned dividends for its stockholders without any additional capital being supplied to bolster up that originally put in, we can, with understanding, appreciate the strength and stability of the industry with which we are connected, and the great possibilities which must come to it in the near future, if we give it that same attention in regard to details and developments which those connected with the industry have given in the past.

"Mr. Byllesby has occupied in this industry, by no means a minor position. I think, probably, on the commercial side of the business, he is as much entitled to credit as any one man in the development of the alternating system which has done so much in enabling us in establishing large generating plants, giving us the opportunity for great economy of production, and establishing large distributing systems, which have added so much to the possible profits of this business."

Henry Manson Byllesby was born in Pittsburg, Pa., February 16, 1859. He is the son of DeWitt Clinton and Sarah (Matthews) Byllesby. His technical education was acquired at Lehigh University, Bethlehem, Pa. His early training and experience brought him in contact with the pioneers in the development of electrical enterprises and his greatest asset in his life's work is the absolute confidence he inspired in the breasts of his contemporaries. Of him it has been said that not only is his word as good as his bond, but that his word was better than his bond. He has had his ups and downs, but when he is up he is up, and when he was down he wouldn't stay down.

For the last eight years he has made a specialty of reorganizing electrical and gas properties and is today at the head of a string of the most successful enterprises in the country. His company does not go in for irrigation, and it has been said that it has no affinity for water, even in stocks; also that his success has been real because he has never been satisfied that a monopoly was any good unless the monopoly worked like as if there was a competitor on every corner.

He is a good man to know. He enjoys the esteem of his old friends. What more need be said? He is president of H. M. Byllesby & Company, a member of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Western Society of Engineers, of the Union League, Midlothian and Lawyers' clubs, and a resident of Chicago.

Mr. Byllesby, in addition to his great responsibilities in connection with his business enterprises, is a public-spirited citizen upon whose shoulders rests the mantle of authority and opportunity for good. He is president of the Civic Federation of Chicago, and a vice-president of the National Civic Federation. In both of these organizations and particularly in the case of the former, Mr. Byllesby takes a leading part in promoting the elemental ideas upon which the foundations of good government are built. His work has been of great service to the community, and his fine reputation and influential circle of friends and acquaintances has made him a power in these organizations.

Aside from his activity as president of H. M. Byllesby & Company, he is connected with many other enterprises.

### The Electrical Booster's Club of Pittsburg.

On the evening of Monday, April 25, the regular monthly meeting and supper of the Electrical Booster's Club of Pittsburg was held at the Duquesne Hotel. There was a full attendance of members and a fine spirit of cordiality and enthusiasm was maintained.

There was no formal paper ready for presentation, and the first speaker, George H. Porter of the sales department of the Western Electric Company, was introduced by C. B. Cushing, the master controller. Mr. Porter briefly reviewed the organization and policy of the Chicago Electric Club.

The next speaker was A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, who explained some of the features of the work of the Chicago Electric Club, and indicated the lines along which an apparently successful luncheon club could be formulated. After considerable discussion, which was participated in by Messrs. Cushing, Harris, Donkin, Pierce, Lepper, Springer and others, it was unanimously voted to appoint a committee to draw up plans for a permanent organization.

The Boosters have been drifting along for nearly two years paying a nominal sum for luncheon and dinner, and meeting in a more or less haphazard fashion. Beyond the selection of officers and the unorganized effort of a few of the members there has not been the unity of purpose which is possible and which will now be rapidly made a feature and a fact. It is apparent that there is a great opportunity for an electric club in Pittsburg, and the present members of the organization are enthusiastic over the prospect of getting the new idea started immediately after the summer picnic.

### Milwaukee Street Railway Decision.

The Wisconsin Supreme Court has handed down a decision upholding an injunction against the Milwaukee Electric Railway and Light Company, in which it is held that interurbans cannot be run over land which has not been condemned according to law. The court orders the electric railway company to cease running its cars on Wells street in Milwaukee until it obtains the right as provided for by law. As it is probable that most of the interurban roads in the state are operated within towns in the same manner as the Milwaukee Electric Railway and Light Company runs its cars in Milwaukee, the decision is of great importance.

The railway company, it is claimed, never obtained the right to run interurban cars over its lines within Milwaukee either from the city or the property owners on the street thus used. For this reason the court holds that the tracks of the street railway company on Wells street cannot be used for the transportation of interurban cars or for doing anything else than street railway business. This will necessitate the interurban cars stopping at the city limits and transferring their passengers to city street cars.

The company will have thirty days in which to ask for a rehearing. At the end of sixty days the injunction will go into effect if no rehearing is asked for. The railway company asked the court that it be allowed to make compensatory damages in lieu of an injunctional order, but it was declared that this was neither possible nor lawful. M.

### Mexico Against Dams in the Rio Grande.

The Mexican government is not in favor of the proposition of granting international authority for the construction of dams across the Rio Grande, along its lower course, according to recent reports.

It is stated that Mexico is willing that these water storage dams shall be constructed at whatever points may be deemed necessary along the upper course of the international boundary stream, but that it asks that no obstruction to the regular flow of the water be placed at any point within about 250 miles from its mouth. It is declared that the Rio Grande is navigable for that distance, and to erect dams across it would interfere with the passage of boats. D.

### New Patent Legislation.

Representative Currier, chairman of the Committee on Patents, has introduced two important bills; one for the purpose of providing that whenever the government shall use a patented invention without first having secured a license or right from the owner to use the same, the owner shall have the right, through a suit in the Court of Claims, to recover reasonable compensation for such use.

The second bill is for the amendment of the trade-mark law so as to provide that no mark which is distinctive and by which the goods of the user of the mark may be distinguished from other goods of the same class shall be refused registration as a trade-mark on account of the nature of such mark except for certain given reasons. F.

### Center Street Subway.

General Manager Calderwood, of the Brooklyn Union Elevated Railroad Company, in reply to a request by the New York Public Service Commission to state more definitely how the company proposes to operate the Center Street subway, writes the commission that the company would furnish at its own expense the necessary electric power. The arrangement with the city should cover a period of not less than five years, and should the city require the discontinuance of the arrangement after the period agreed upon, it shall reimburse the company for all money expended in connection with the installation of the power plant.

### Moving Platform Bill Signed.

Mayor Gaynor has signed the bill giving authority to the New York Public Service Commission to authorize the installation of a moving platform system in New York. This has reference to the Continuous Securities Transit Company, which is ready to install the platform as soon as the Public Service Commission asks for bids for construction and operation. It is to be built under Thirty-fourth Street, and if successful another will be built under Broadway from Tenth to Forty-second Streets. The bill which the Mayor signed is an amendment to the rapid transit law, and besides conferring authority to install the moving platform, permits the railroad to lease its motive power instead of manufacturing it.

### Philadelphia Subway.

A charter has been granted to the Philadelphia and Suburban Elevated Railroad Company, nominal capital $1,000,000, by the commission consisting of Governor Stuart, Attorney General Todd and Secretary of State MacAfee, and application made to Philadelphia for a municipal franchise.

Over half of the bond issue, which will amount to between $16,000,000 and $20,000,000, has already been subscribed for.

# Mechanical Features of Electric Drive in Machine Shops.[1]

## Dealing Chiefly with the Plant of the General Electric Company.

BY JOHN RIDDELL.[2]

It is with the mechanical features of motor driving that this paper is to deal, and chiefly with what has been done in the electrical equipment of the most commonly used machine tools in the plant of the General Electric Company, at Schenectady, N. Y., with a few sketches of some large work that has been erected outside.

Some ten or twelve years ago it was decided to erect a large and up-to-date electrically-driven machine shop, and plans were started some time ahead of the completion of the building. At first the plan was to have every machine tool individually driven, but the time was so short that we abandoned this idea and concluded to arrange the machines in groups, driven by a motor direct-coupled to the end of a section of lineshaft. This arrangement was used only to take care of small and medium-sized machines, of which few, if any, were at that time equipped with individual motors.

Considerable difficulty was experienced in arranging the lineshafts and countershafts in this system, owing to their being traversed by small side-bay electric cranes. Figure 1 gives a general idea of this method of group driving. However crude it may appear in the light of present practice, it was considered in its time thoroughly up-to-date.

One of the mechanical difficulties encountered in attaching individual motors to small machines was the unwieldy size of some of the earlier motors of small capacity. Sometimes the motor would be as large as or larger than the machine and this feature was largely responsible for the prevalence of group driving of small machines, even where the individual drive would have been preferred. Recent improvement in motor design has led to a great reduction in the size of motors for a given capacity, so that the twenty-five-horsepower motor of today is not nearly so large as the ten-horsepower motor of earlier years. It is, therefore, much easier now to make the motor an integral part of the machine; and even where only fractional parts of a horsepower are required, for light operations, suitable motors of very small weight are now available which are well adapted in size to the smallest tools.

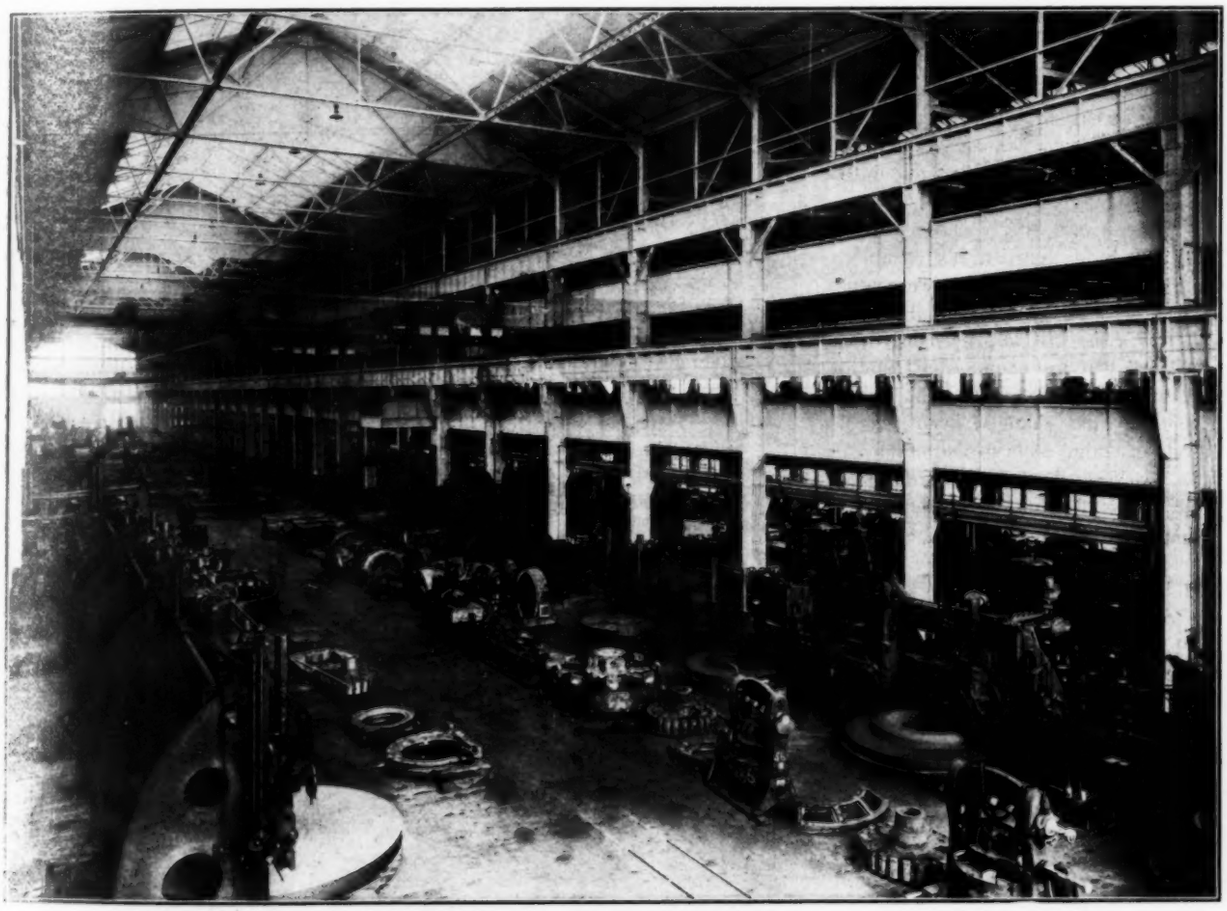


FIG. 12.—INTERIOR VIEW OF BUILDING NO. 60, SCHENECTADY WORKS, GENERAL ELECTRIC COMPANY.

[1] A paper presented before a joint meeting of the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, at New York, N. Y., April 12, 1910.

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SMALL MACHINE TOOLS.

Figures 2, 3 and 4 show good examples of individual motor drives, in which the motors are inconspicuous and form integral parts of the machine tools. Figure 2 shows a lathe driven by an induction motor concealed in the cabinet leg. Figure 3 illustrates a wood-boring machine driven by an induction motor through a single pair of bevel gears. The inverted motor is bolted to a plate, which is in turn bolted to the bottom of a post and to the frame of the tool. At first, the plate was arranged to swivel on the tool post, in order to provide means for moving the tool longitudinally over the work; but later, this adjustment was abandoned, as it proved to be easier to move the work horizontally with reference to the tool. This tool is a good example of the compactness of the electric motor, and its easy adaptability to woodworking machinery. Figure 4 shows the application of a direct-current motor to a twenty-four-inch swing saw.

LARGE MACHINE TOOLS.

The large lathes, vertical boring mills, planers, milling machines, etc., were supplied each with its own individual motor, which was a marked improvement over the original belt-and-countershaft methods of driving. Since starting this work, the company has changed over several thousand machine tools to motor drives. Most of the difficulties in changing from belt to motor driving were in making suitable connections between the motor and the tool to be driven. We do not pretend that in every case we have adopted the best arrangement, as in many cases the machine tool is not of sufficient value to warrant an expensive mechanical connection.

Take, for example, a medium-sized lathe of relatively moderate value. If an expensive transmission device was required in order to apply a motor to the lathe, the total cost of the lathe, as changed, might easily be more than the price of a new lathe especially designed for motor driving. In such cases it is found expedient to erect the countershaft and cone about four feet above the headstock, on suitable brackets, fasten the motor in a convenient place on the machine, and continue the use of cones and belts. Such an arrangement is shown in Figure 5.

In all cases where old machine tools are converted to electric driving, it is desirable to mount the motor on some part of the machine if possible, rather than on the floor near the machine. In the former case, the machine tool constitutes an independent self-contained unit which can be moved by the crane as a whole and located wherever desired. Cleanliness is promoted, by leaving a clear floor space to sweep, and the motor is less liable to accumulations of dirt caused by sweeping. There is also a tendency for the motor and the machine tool to become shifted out of alinement, if they are separately mounted on the floor.

For lathes of more importance, and where the value of the tool warrants, we make an all-gear drive, with reversing gears, which are used principally for screw cutting. Figure 6 shows a lathe equipped with reversing gears. More recently we have produced motors which can be very quickly reversed, obviating the necessity of reversing-gears.

When the original change was made from belt to motor drive there was one particular triple-geared lathe, seventy-two-inch swing, to which we applied a two-to-one variable speed motor. The only change necessary in this case was to substitute two gears for the lathe cone, mounted on a quill, and made to engage with a pair of rocking gears on the motor. This gave a speed variation of four to one at the motor, and with the triple gears of the lathe, we had an exceedingly fine speed range. This lathe is shown in the foreground of Figure 7. The motor is placed in a most advantageous position, in the headstock underneath the spindle. During about ten years' service it has never been removed.

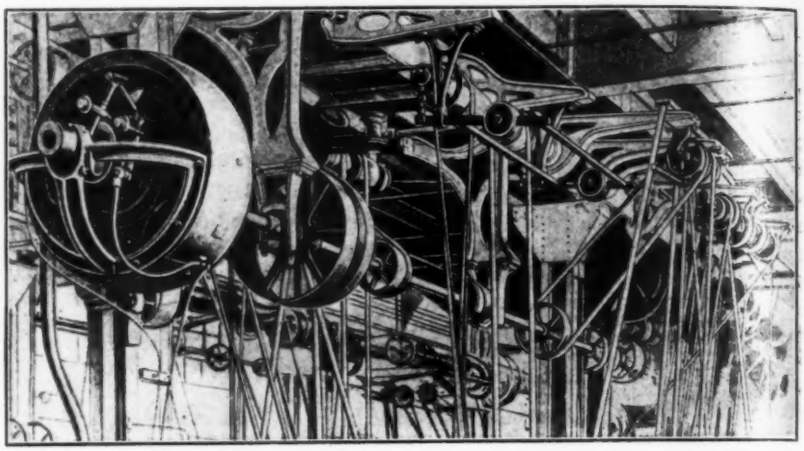


FIG. 1.—METHOD OF GROUP DRIVING.

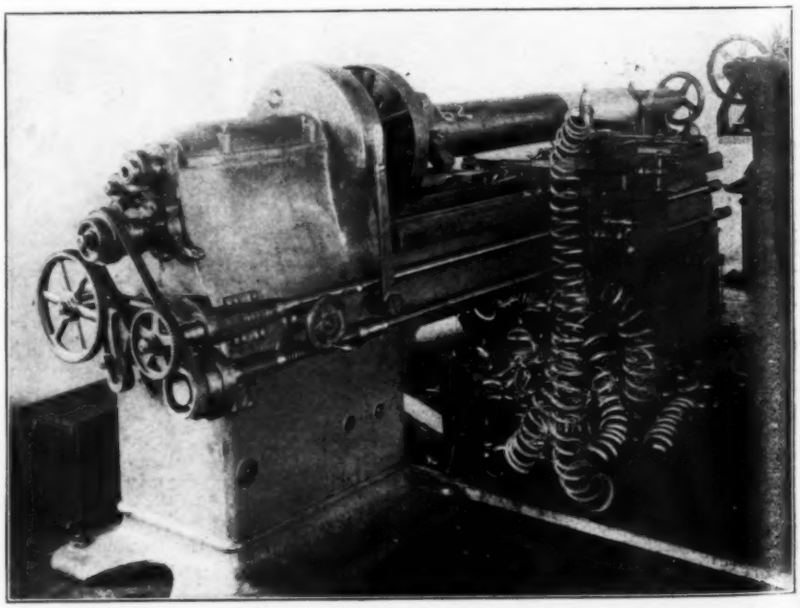


FIG. 2.—LATHE DRIVEN BY INDUCTION MOTOR CONCEALED IN CABINET LEG.

In a shafting department like that of the General Electric Company, where the range of size does not vary over three or four inches on the standard work, no very great speed changes are necessary, and a two-to-one motor usually has range

FIG. 3.—WOOD-BORING MACHINE.

enough to meet all requirements. What is particularly needed is ample power, strength of parts, and simplicity of construction, especially in lathes for roughing, which are usually handled by unskilled labor.

For finishing shafts, however, where greater accuracy is required, an all-gear drive with steel gears is not satisfactory, because the chattering set up by the action of the gear teeth is very apt to be transmitted to the finished work, leaving parallel ridges. This difficulty was overcome in some special lathes which we had built for the purpose, in which the driving gear on the main spindle was left loose and acted on the driving plate, keyed to the spindle, through four rubber buffers. This device is shown in Figure 8.

More recently, trouble from this same cause was experienced in one of our tool departments, and was corrected by the use of a pinion made of muslin. This pinion has several features which specially adapt it to motor-driven machine tools. It is practically noiseless and very durable, does not shrink, and is sufficiently flexible and elastic to absorb vibrations which might be transmitted to the finished work.

Another application to motor driving in connection with lathes, and one that has been much appreciated, is the use of an auxiliary motor to operate lathe carriages having a long travel, of about thirty-five feet. The motor is bolted to one side of the carriage, and carries a pinion which meshes with the hand-wheel gear. A two-way switch is provided for operating the motor in either direction. The use of a motor not only saves the operator a difficult task, but it has also proved a great economy of time. It formerly required thirty to thirty-five minutes to shift the carriage through its full travel, and the handwheels were placed so low that a man had to stoop to use them. The motor will move the carriage from one end of the lathe to the other in a minute and a half, and it can be stopped at any point within a one-sixteenth-inch of the cut.

The best location for a motor on a lathe, and on most machine tools, is as low down on the machine as possible. The amplitude of the vibrations set up will be smaller, the closer the motor is to the floor, and the liability of chattering will therefore be reduced. The location of the motor in the cabinet leg, or in the headstock of a lathe, as shown in Figure 2 and Figure 7, is ideal, but there are, of course, many cases where the motor must be mounted over the headstock because no other place is available. The necessity of having the motor out of the way of the work is obvious, as turnings of chips, if allowed to get into the motor, would at once give rise to electrical troubles, especially in direct-current machines.

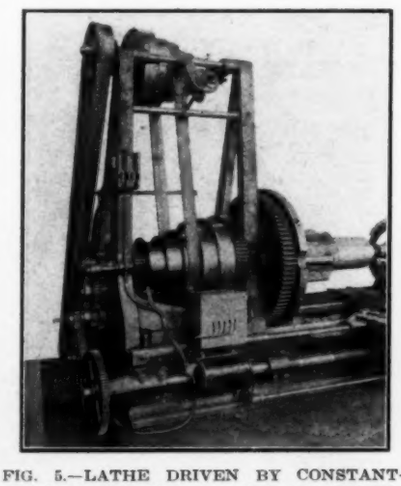


FIG. 5.—LATHE DRIVEN BY CONSTANT-SPEED MOTOR USING CONES AND BELTS.

### CONTROLLERS.

The location and arrangement of controllers for lathes depend upon the class of work to be performed. Where the lathe is started, stopped, and varied in speed by the controller, the latter should be mounted on the front of the lathe, and the handle extended by means of a shaft to the lathe carriage, where it will be constantly under the hand of the operator. Ease of control unquestionably results in the rapid and economical production of work. Where the work varies considerably in diameter, frequent changes of speed will be required, and

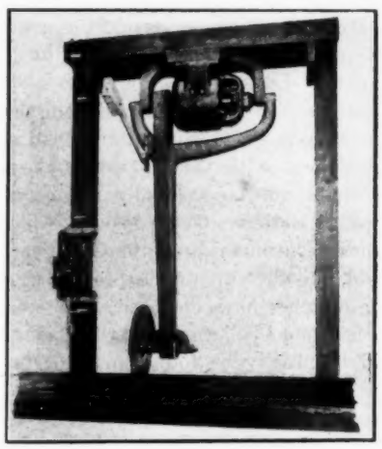


FIG. 4.—MOTOR-DRIVEN SWING SAW.

where the most efficient cutting speed can be obtained by simply turning a conveniently located handle, the work will be turned out at a maximum speed. If frequent shifting of belts is required, a great deal of the work will be done at less than maximum speed, owing to the extra exertion involved.

For lathes with constant-speed motors operated with clutches and shifting levers, or machines on which continuous automatic operations are carried on, such as screw machines, the motor can be kept running for long periods without attention from the operator. In such cases the controller may be mounted at any convenient place on the machine, or near by on the floor, by means of a bracket.

### PLANERS.

Figures 9, 10 and 11 illustrate the evolution of the application of motors to driving planers at the Schenectady shops. The first step, as shown in Figure 9, was simply to discard the lineshaft and drive the countershaft from a motor placed on the floor. When this planer was operated by belts it was next to impossible to reverse it in a shorter space than about thirty inches, and even then with a great deal of wear and tear on the belts. Early in 1900 the company produced its first magnetic clutches for driving planers. The first of these

clutches was applied to a Bement-Miles planer, ten feet wide by twenty feet long. With this clutch, Figure 10, we are able to reverse the planer practically to a line, and to reduce the space required for reversing to about twelve inches. Some trouble was experienced, however, with these first magnetic clutches, owing to the design of the magnets, and pneumatic clutches of a peculiar design were subsequently adopted and have been entirely satisfactory. Figure 11 shows the arrangement of the motor and pneumatic clutch, as applied to the planer.

Our second lot of magnetic clutches was redesigned to eliminate difficulties experienced with the first lot, and the new ones were applied to a number of portable slotters. These machines have been in continuous operation practically night and day up to the present time. The clutches have operated with entire success, and I believe the magnetic clutch will eventually be found an important and efficient feature of transmission gears for planers and slotters.

VERTICAL BORING MILLS.

In our original scheme for attaching motors direct to boring mills, an all-gear drive, with variable-speed motors, was selected, and with very slight changes, has been employed up to the present time. Figure 12 shows a number of boring mills equipped in this way. The motors are not visible in the illustration because they are placed below the floor level between the sides frames back of the revolving table. A solid foundation is laid, extending under the entire machine, a depression in the back between the side frames forming a bed for the motor, which is securely fixed in position. This common foundation makes the motor and the machine a single compact unit, and no additional floor space is required for the motor. No work put upon the table can interfere with the motor, the gears are entirely out of sight, and the controller is placed at the right-hand side of the machine, where the operator usually stands.

On boring mills from twenty feet to twenty-five feet in diameter, with the usual slow intermediate and direct-gear drive that comes with the mill, a variable-speed motor of two-to-one ratio gives a very satisfactory speed range.

Various machine tools of the portable type are used in ordinary large machine shops, and are placed in various positions on iron floor plates. The efficiency of these machines, such as rotary planers, slotters, etc., used in erecting departments, has been greatly increased by the use of electric motors. A group of these tools working on a large casting is shown in Figure 13. The use of portable tools was almost impossible before the advent of the electric motor, but now the machine tools used in erecting shops, and in isolated places away from the source of power, when equipped with electric motors are ready to run at a moment's notice. On up-to-date rotary planers the motor is placed on the carriage; the underside of the bases is planed, and means are provided for transfering the planers by electric cranes.

Under the old arrangement, if machinery stood idle for days and weeks, the countershafts and loose pulleys were so neglected that they would squeak; some one would then throw off the belts to stop the noise, and two hours' work was frequently necessary before they could be started for a hurried job. The same thing is true of some boilermakers' and blacksmiths' machines.

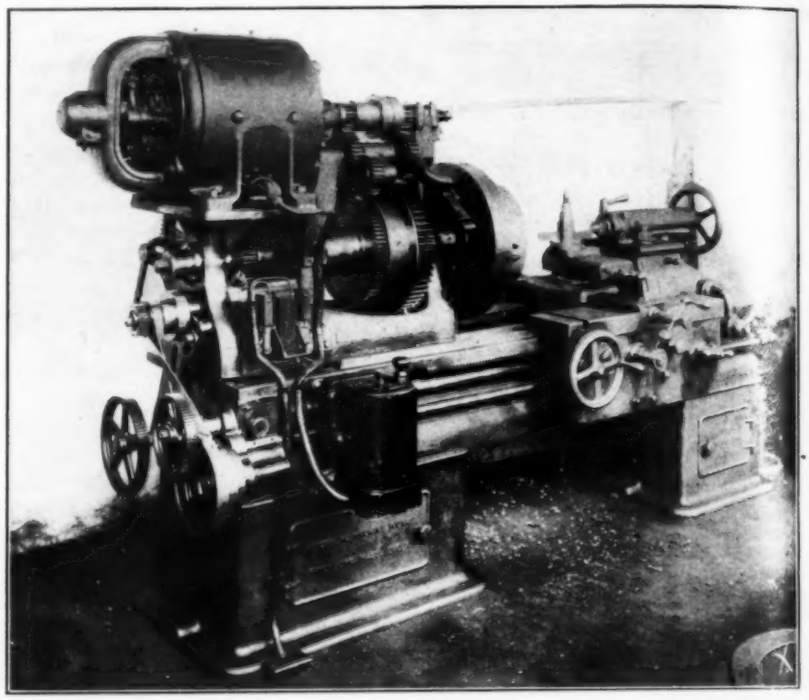


FIG. 6.—TWENTY-FOUR-INCH LATHE DRIVEN BY MOTOR, WITH REVERSING GEARS.

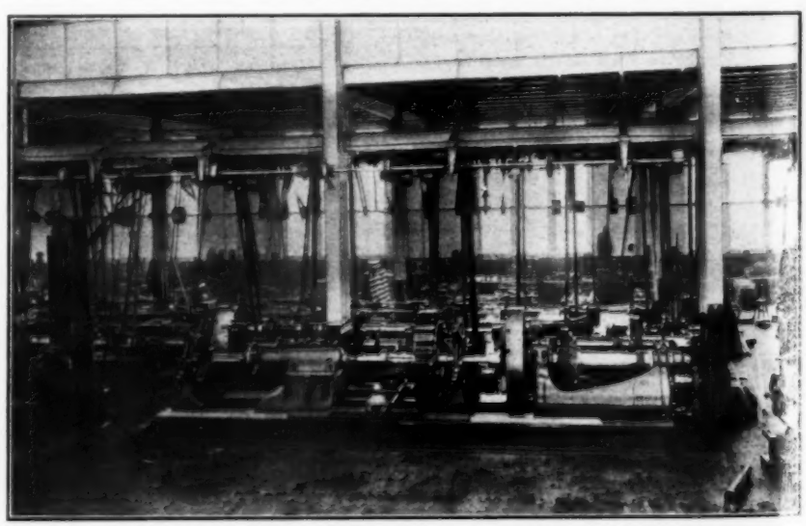


FIG 7.—LATHE WITH MOTOR IN HEADSTOCK BENEATH SPINDLE.

BELTING.

Twenty-five or thirty years ago, in the days of the old jobbing shop, the buildings were not so high-studded, and the lineshafts and countershafts were usually within reach of a twelve-foot or fifteen-foot ladder at the most. Cone belts running to machine tools were very easily manipulated, and an expert lathe hand would never think of using a pole for shifting his belt from one step of the cone to another. But in these days of sanitary buildings, with ceilings from twenty to twenty-five feet high, it becomes an exceedingly difficult problem to arrange countershafts within reasonable heights, to say nothing of the necessary length of the vertical belts, the dust set in motion, and the difficulty of painting and whitewashing ceilings for the sake of cleanliness.

Another condition of lineshaft driving which has not been much spoken of, of late, is the difficulty of keeping the shaft in alinement, where the hangers are suspended from the roof trusses. The writer has seen such shafts five or six inches out of alinement, due to a heavy fall of snow on the roof, or to the settling of foundations. Another trouble is due to state laws and shop rulings, where a few trained men are employed as belt-lacers, and it is against the rules for men who are not belt-lacers to do the work. This is the cause of numerous delays, with consequent loss of production.

The only advantages that may be claimed for belts is that they take up the vibration of the gears, and thus prevent chatter marks on fine work; and that they will slip under overload and be thrown off the pulley, stalling the machine, instead of breaking the tool or spoiling the work. It has already been explained how the effect of vibration has been remedied by means of rubber buffers or muslin pinions, and there are exceedingly few cases where belt-slip is not a detriment rather than an advantage. The use of high-speed tools calls for a considerable increase in the power necessary to drive the machines, as these tools take a heavier cut at a higher speed than those of carbon steel. These conditions make belt-slip very objectionable, and one of the chief advantages of motor driving is that it increases the power of machine tools beyond the capacity of belts of reasonable length. Modern practice is in the direction of eliminating the belt almost entirely, although there are a few machine tools, such as the older types of automatic-screw machines, grinding machines and some wood-working machines, on which they are necessarily retained.

The great majority of metal-working machines are best adapted to motor driving through all-gear connections, although a few machines, such as small grinders, buffing wheels, polishing wheels, etc., are best connected direct to the motor shaft.

STEEL-MILL WORK.

The application of motors to metal-forming machines, such as rolls for rolling steel, charging cranes, etc., does not belong strictly to machine-shop practice, but the work of these machines is closely allied to what is required of other metal-working machines. Some of this work now performed by motors, is the heaviest kind of mechanical work ever attempted by any kind of prime mover. Fig. 14 shows a large induction motor driving an up-to-date steel rail mill, requiring 6,000 horsepower or more. The operation of an entire mill is frequently dependent on the continuity of operation of each piece of apparatus. For this reason it has been the practice to build the steam engines which drive mill ma-

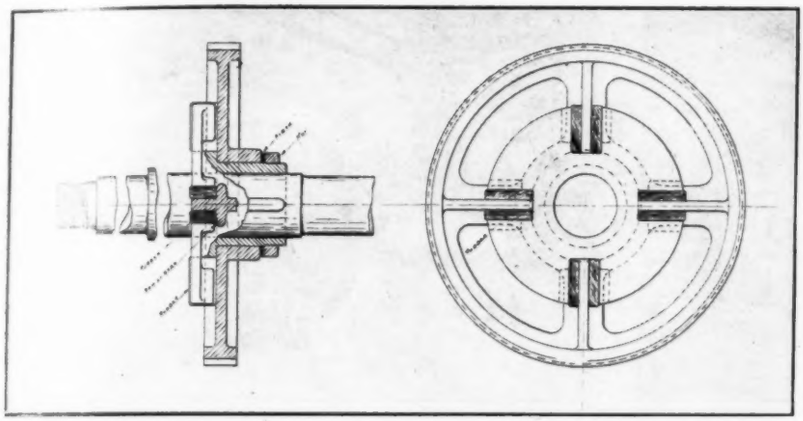


FIG. 8.—DIAGRAM OF DEVICE TO OBVIATE CHATTER MARKS ON FINISHED WORK.

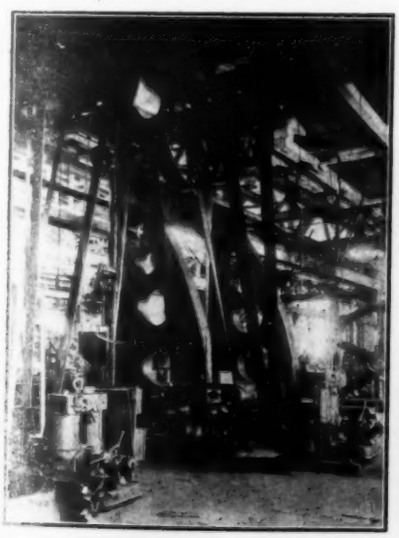


FIG. 9.—EVOLUTION OF MOTOR-DRIVEN PLANERS—LINE SHAFT DISCARDED.

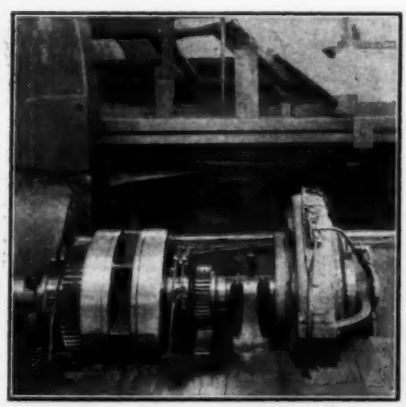


FIG. 10.—EVOLUTION OF MOTOR-DRIVEN PLANERS—MAGNETIC CLUTCH.

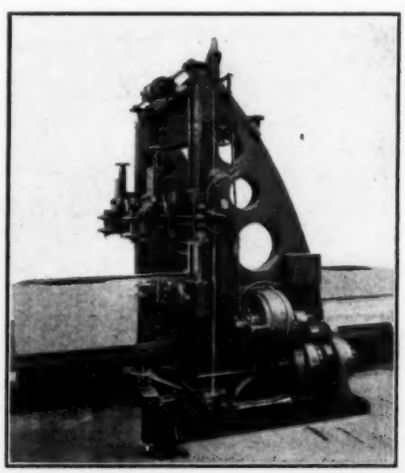


FIG. 11.—EVOLUTION OF MOTOR-DRIVEN PLANERS—COMPRESSED-AIR CLUTCH.

chinery of the most substantial material and design. In replacing engines by electric motors, these same features were embodied in the motors.

The breakable coupling between the engine and the rolls is retained when motors are used. This coupling is of such strength that it breaks before the rolls are injured by shocks. The coupling frequently breaks diagonally, and a very heavy end-thrust is sometimes produced, tending to separate the ends of the coupling. With the engine drive, this end-thrust frequently slides the roll housings out of their places, and considerable time is required to replace them.

When motors are used, this difficulty is readily avoided by allowing the shaft of the motor to slide longitudinally in its bearings. To keep the motor shaft in its proper position, a breakable end-thrust bearing has been devised, which allows a bolt to break at a predetermined pressure before any other part of the machinery can be injured. This breakable bearing is shown in Fig. 14. It acts through the breakage of the long bolts shown alongside of the bearing housing. The ready replacement of the parts when the coupling breaks is only one of the advantages incidental to the use of the motor for driving rolls.

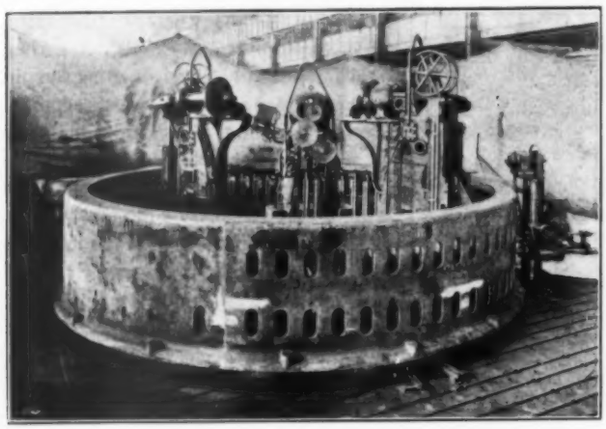


FIG. 13.—MOTOR-DRIVEN TOOLS ON IRON FLOOR PLATE.

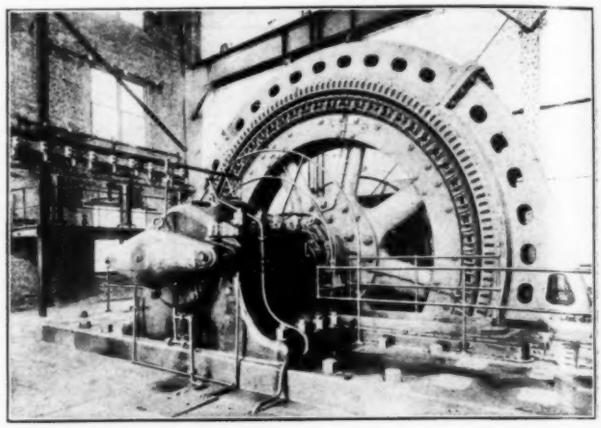


FIG. 14.—6,000-HORSEPOWER MOTOR-DRIVEN RAIL MILL.

Another style of motor, known as the mill motor, is illustrated in Figure 15 and Figure 16. It is used on slab-charging cranes, screw-downs, mill tables, etc., where it is subject to very rough handling, intense heat, severe overloads, dirty surroundings, and other unfavorable conditions. All portions of these motors, such as the frame, shaft and bearings, are built unusually heavy to withstand safely the shocks to which they are subject.

At the Schenectady plant alone we have running some 8,500 machine tools, of which 8,150 are individual motor-driven. Group-driving has been adopted for some sensitive drills, speed lathes, and other small miscellaneous machines. Of the above tools there are forty-eight portable machines, consisting of slotters, milling and drilling machines, radial drills, etc. These machines are operated on 32,675 square feet of iron floor plate, in addition to which there are 7,000 square feet of iron rails, cemented into the floor, for erecting purposes.

Had we continued our extensions since 1899, using lineshafts, countershafts and belting, we would have approximately 34,570 feet of lineshaft, or about six and one-half miles, and about four and three-quarter miles of countershaft which would require about 21,225 hangers and bearings. Allowing two belts to each machine, with an average length of twenty-five feet per belt, we would have for the 8,500 machines a total of 425,000 feet of belting, equal to about eighty and one-half miles.

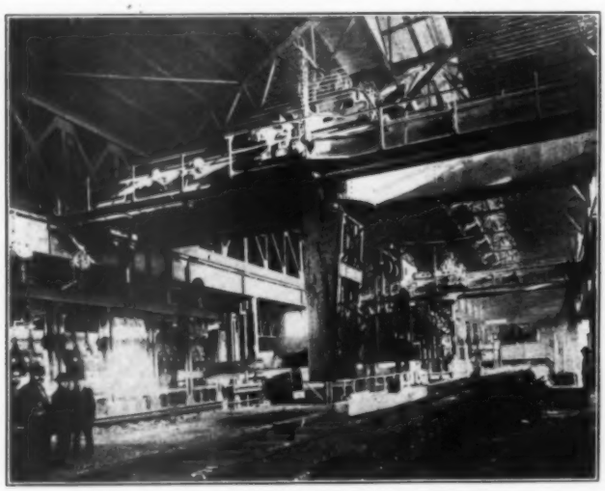


FIG. 15.—CHARGING CRANE, BLOOMING MILL.

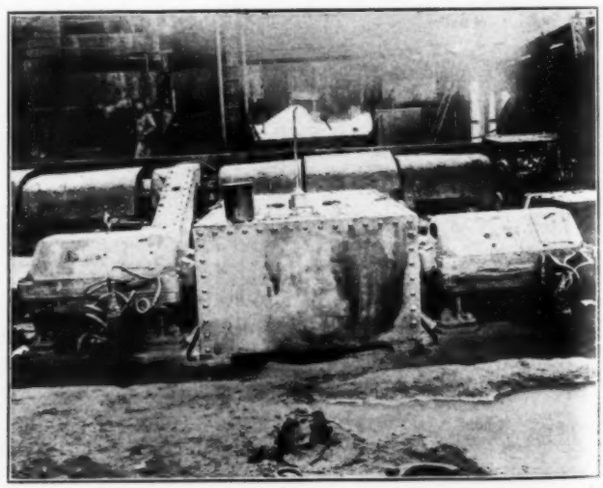


FIG. 16.—TWO FIFTY-HORSEPOWER DIRECT-CURRENT MOTORS.

### American Physical Society.

In his paper read before the recent meeting of the American Physical Society, a brief report of which was published in the issue of April 30, on "Reliability of Magnetic Measurements on Rods." Dr. Burrows pointed out that the straight rod was the most convenient form of specimen, and gave the results of comparative measurements on the same rods made by a number of different methods and apparatus, with especial reference to commercial permeameters. The results were expressed in terms of the values obtained by the author's method, in which yokes with compensating turns over the joints were used. Perhaps no maker of such apparatus will admit that results with his own apparatus could be in error by more than five per cent, yet the comparisons revealed differences running as high as thirty-five per cent, when expressed in terms of the magnetizing field necessary to produce a given flux. The specimens used ranged from nickel to Norway iron and commercially pure ingot iron, and included various steels.

The discrepancies observed were attributed by the author to two principal causes. At low flux densities, the free poles resulting from the air gaps in the circuit contribute their part to the total magnetizing field, but this is not always taken sufficiently into account. At high flux densities, the air space surrounding the specimen and included in the measuring coil carries flux which is credited to the specimen.

The work is to be continued and further reports will be made.

In the "Preliminary Report on the Temperature Coefficient of Resistivity of Copper," J. H. Dellinger shows that the conductivity and temperature coefficient of copper are proportional. The samples thus far investigated represent a number of the chief sources of supply of copper wire. Native lake copper, and copper refined by smelting and by electrolysis, are included. The relation holds for differences of conductivity due to differences in physical properties, as well as for those due to differences in chemical composition. For example, hard-drawing and annealing are found to produce proportional changes in the conductivity and the temperature coefficient. The range of conductivity is from 94.5 per cent to 101.8 per cent (on the basis of 100 per cent conductivity corresponding to 0.15302 ohm per metre-gram or 1.7213 micro-ohms per centimetre-cube, at 20 degrees centigrade). The samples investigated are accordingly fairly representative of the copper now in use for electrical purposes.

Using this result, a measurement of the conductivity of a sample gives also its temperature coefficient. Thus, $\alpha_{20}$ (in the formula, $R_t = R_{20}\ [1 + \alpha_{20}\ (t—20)]$ for a sample of copper is given by multiplying 0.00393 by the percentage conductivity. The relation also indicates that the measurement of conductivity may be replaced by the often more easily made determination of temperature coefficient.

We have herein an explanation of the disagreements of previous determinations of the temperature coefficient of copper. The value assumed by the American Institute of Electrical Engineers, $\alpha_0 = 0.0042$, or $\alpha_{20} = 0.00387$, is the true temperature coefficient for copper of 98.6 per cent conductivity.

### The National Association of Cotton Manufacturers.

The eighty-eighth meeting of the National Association of Cotton Manufacturers was held in the Mechanics Fair Building, Huntington Avenue, Boston, Mass., April 27 and 28, this time and place having been selected on account of the textile machinery exhibition which occupied the building during the same week.

This association is one of the older technical organizations of this country reaching back to 1854, during which time it has had a continuous and active existence holding two meetings a year for the purpose of considering matters pertaining to improvements in the cotton manufacture.

Among the papers presented were included the following, which are of interest to engineers in general: "Progress of the Diesel Engine," by E. D. Meier; "Superheated Steam and Superheaters," by D. S. Jacobus; "Buying and Handling of Steam Coals in New England," by John S. Lawrence; "The Electric Drive as a Manufacturing Proposition," by Meldon H. Merrill; "Choice of Power for Textile Mills," by Charles T. Main; "The Distribution of Artificial Light," by Frank Marshall Scantlebury. The last-named paper is given on other pages of this issue.

The address of welcome was given by Governor Eben S. Draper, and was replied to by Franklin W. Hobbs, vice-president of the association. There were 425 present in all.

The association medal for the most useful contribution to cotton manufacture during the year was awarded to Dr. C. J. H. Woodbury for his work on the bibliography of cotton manufacture.

### New York Commission Fixes Dates for Subway Hearings.

The New York Public Service Commission has fixed May 9 and 16 as the dates for public hearings on the subway contracts. The points for consideration are: construction, equipment and operation of the Triborough Rapid Transit Railroad (consisting of the Broadway-Lexington Avenue line, the Canal Street line, the Broadway-Lafayette Avenue line and the Fourth Avenue line and operating rights in other subways).

The hearing on May 9 will be devoted to the discussion of the contract for construction, equipment and operation of the entire Triborough system, consisting of the Broadway-Lexington Avenue, the Broadway-Lafayette Avenue and Canal Street lines and the Fourth Avenue extensions, with the privilege of operating the Fourth Avenue line and operating rights in the Centre Street loop.

The hearing on May 16 will be on the form of contract for municipal construction section by section of the lines before mentioned.

### National Fire Protection Association.

The fourteenth annual meeting of the National Fire Protection Association will be held at the Hotel La Salle, Chicago, May 17, 18 and 19.

Several committees have prepared reports which will be read before the members. On the afternoon of May 18 a visit will be made to the Underwriters' Laboratories, Inc.

At the special stockholders' meeting of the Missouri and Kansas Telephone Company in Kansas City, Mo., it was unanimously voted to authorize an increase in the capital stock from $5,000,000 to $20,000,000.

# DEPRECIATION AND RESERVE FUNDS OF ELECTRICAL PROPERTIES.

PAPER BY WILLIAM B. JACKSON, AND DISCUSSION, AT A JOINT MEETING OF ENGINEERING SOCIETIES IN CHICAGO.

A joint meeting of the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers was held at the rooms of the Western Society of Engineers, Chicago, April 27. The paper presented before the meeting was "Depreciation and Reserve Funds of Electrical Properties," by William B. Jackson.

An abstract of Mr. Jackson's paper follows:

Every company operating an electric light and power property, a street railway property, or a telephone property, or contemplating entering into any such field of activity, must take into account certain expenses that cannot be appropriately included in the day by day operating and office costs or in the current maintenance expenses of the property, if its accounts are to show in full the actual cost of performing the services required.

I refer to the sums of money that must be set aside to cover depreciation replacements and to provide a reserve fund to care for extraordinary costs as hereafter explained.

The term *depreciation* as here used may be divided into two parts.

1. Decrepitude—Which covers the gradual wearing out of the apparatus from the effects of use and of age, which cannot be overcome by current repairs, and which results eventually in ending the operative life of the apparatus.

2. Obsolescence—Which takes into account the reduction in the useful life of apparatus, on account of advances in the art whereby otherwise operative apparatus is made uneconomical for further use.

The term *reserve fund*, as here used, may also be divided into two parts.

1. Required Reconstruction—Which takes into account reconstruction costs made necessary by municipal or other legislative requirements.

2. Special Insurance—To cover expenses that cannot be forecast with any degree of certainty, caused by extraordinary occurrences such as unusual storms, explosions, great conflagrations, acts of strikers, etc.

In considering *depreciation* it is well to clearly separate in one's mind the annual depreciation of the plant as an average whole and that of the component parts making up the plant. To obtain the true amount of the annual depreciation in the value of any property, it is necessary to estimate a sum of money which represents the yearly depreciation of each of the component parts of the plant, and the aggregate of these sums of money for all parts of the installation gives the annual depreciation for the plant. This may be converted into a percentage on the total value of the installation which is subject to depreciation. Any method of arriving at the amount of annual depreciation that does not take into account the individual depreciations of the component parts of a plant, must be an approximation at best, even though it may be based upon results obtained in a correct manner for other similar plants, and it may be very far from accurate.

This division of a plant into its component parts for purposes of determining its annual depreciation is usually a simple matter. It requires that each of the component parts shall be such that when it has reached the end of its useful life the part in its entirety will be discarded, and that it shall be possible to intelligently determine its probable salvage value as a whole. If these requirements are not fulfilled the part should be divided until they are.

If we consider the overhead distribution lines of an alternating current electric light plant, the lines may be divided into the following parts: bare wire, weatherproof wire, rubber covered wire, transformers, lightning arresters, insulators, and poles and cross arms with their hardware; and in some cases there may be further divisions.

The total amount of depreciation to be annually charged against any part of the installation should be equal to the first cost of the part installed ready for service plus the cost of removal, less any salvage obtainable for the part when discarded, divided by the years of probable life of the part.

The estimation of what is the fair useful life for any part of a plant presupposes a thorough knowledge of the nature of the service demanded of the part, a broad acquaintance with the general experience respecting like kinds of plant, a studied survey of the probable effect of local conditions upon the useful life, and a keen knowledge of the past and present progress of the art for the purpose of making an intelligent forecast of the rate of depreciation caused by approaching obsolescence. A fair determination of the useful life is thus based upon several independent variables, and the result must be reached by judgment after duly applying what seems to be due weight to each of the factors involved.

The factor of obsolescence entering into the question of useful life of plant, whether of buildings, machinery, or other plant, is a disturbing one This has the effect of reducing the estimated useful life of many parts of most plants below that which would be indicated by the ravages of decrepitude, and it likewise affects the probable salvage. Where the factor of obsolescence is estimated as likely to terminate the useful life of a part before decrepitude would be likely to cause its rejection, the former factor must determine the useful life. Consequently, the factor of obsolescence may be the determining factor in fixing the length of the useful life of some parts of a plant, and decrepitude may be the determining factor in fixing the length of useful life of other parts. In other cases these two factors may jointly influence the length of life. The factor of obsolescence has been an exceedingly important one in the several kinds of properties under consideration, and especially so in connection with all kinds of switchboards and other controlling apparatus. But its effect is very apparent, even when considering what we think of as the most stable parts of an electric generating plant, though revolutionary effects are not so apparent today as they have been in the past.

Most public service companies are forced to make large expenditures by ordinances of municipalities or by other legislative action. These are required changes, such as changes from overhead construction to underground construction, relocation of distribution lines on account of new street surveys, changes from wooden poles to iron or steel poles, changes in track construction owing to paving of streets, etc. The costs of such changes up to the value of the original construction should not be made an addition on capital investment and they cannot appropriately be considered as a part of current maintenance, but they should be provided for by a *required construction* fund. An adequate estimate of a suitable yearly contribution, on account of required reconstruction, can only be accomplished after a careful study of what expenditures have been made in the past.

The question of what annual charge should be made on account of *special insurance* is also difficult to solve with exactness, but it is one of which sight should not be lost.

These factors of *required reconstruction* and of *special insurance*, which I have considered under the heading *reserve fund*, are quite different in their characteristics from depreciation, but a plant will just as surely get into the breakers if its reserve fund, or some equivalent to meet these expenses, is not kept in good shape as when no provision is made to take care of depreciation.

If replacements are taken care of by capital account, a property becomes burdened by an imaginary capital investment in physical property which is almost sure to be a serious handicap when the company desires to reduce rates or make improvements. Where replacements are permitted to be taken care of by capital account, the capital account becomes something like the wallpaper in a room (to use a homely comparison) which has been put on layer upon layer, the old not having been removed when the room is newly papered. The papering is not worth more than the last effective layer, and in fact the lower layers sometimes prove the destruction of the whole, and so it may be with an inflated capital account.

By capitalizing replacement costs, the burden of carrying these costs is thrown upon the future without limit of time in cases of unlimited franchises, when this burden should have been borne by the past, except during the period in which a company is still in process of building up its business to a remunerative one.

Most plant managers have not yet come to a full appreciation of the dire straits a plant must come to sooner or later if the depreciation appropriations or their equivalent are not systematically and intelligently attended to. We may consider, for example, a property having a large investment in pole lines, This may amount to as much as ten per cent of the value of the plant. For the first ten years comparatively few replacements of poles will be required, but during the next two years most of the poles may have to be replaced. Thus an average amount of money equal to almost five per cent of the plant investment may need to be expended each of these years for pole replacements alone, and other parts of the plant are surely and irrevocably coming to the same condition. Thus, if there has not been due regard given to a depreciation fund, or the plant is not extraordinarily prosperous, great difficulty will be encountered in obtaining the necessary money for replacements when their need begins to be acutely felt.

A third division is sometimes made in depreciation, called *inadequacy*. This factor covers costs which are occasioned by the necessity of discarding otherwise serviceable plants on account of growth of business. For example, if an electric plant is operating with three small dynamos, and it is found necessary to increase its capacity, it may be best to displace one small dynamo by a larger one, even though the small dynamo may be far short of having operated during its entire useful life.

The expenses that are considered in the foregoing pages are as real as the pay-roll and other daily operating expenses of a plant, but the ravages of depreciation frequently do not show to a noticeable degree until several years after the beginning of the operation of a plant, and there are also likely to be long periods during which it is unnecessary to make much, if any, outlay on account of required reconstruction and special insurance. For these reasons there is serious danger of overlooking the

importance of these expenses in promoting a new enterprise, or in the early days of the operation of a public service company. But if the earnings of a company, after it has become well settled in its business, are not sufficient to cover a fair appropriation annually to the depreciation and reserve funds, as well as to cover the regular operating expenses and a reasonable return on the investment, that company is one that conservative investors should shun. If the conservatively estimated earnings of a new project do not show that they will provide such return it should not be considered an attractive project.

Having considered the general question of depreciation and reserve funds, let us now consider how the principles involved should be applied.

Few classes of apparatus depreciate in value by equal yearly increments, but nevertheless the final effect of decrepitude or obsolescence is to eventually wipe out of the true assets of the company the value of the property less the amount saved by salvage. Such being the case, it will be readily seen that a piece of apparatus having a useful life of $n$ years, for example, will be in service just $n$ years, each year of service will reduce its serviceableness to the owner one $n$th part. Its depreciation should, therefore, be based upon equal yearly increments of one $n$th, in determining the annual contribution that should be made toward the depreciation fund.

Therefore an annual contribution to the depreciation fund should be made such that in $n$ years it will accumulate an amount equal to the first cost of the part installed ready for service minus the net salvage, net salvage being defined as the junk value less the cost of removing the part and preparing it for sale, that is, as the net sum recovered. But the annual contributions should draw interest at the usual trust rate for the state in which the plant is located, and the annual contribution to the depreciation account is, therefore, less than one $n$th of the first cost of the part. Thus, if the trust rate is four per cent and $n$ is ten years, the actual percentage of the cost that need be set aside annually would be 8.33 per cent of the first value of the part minus estimated net salvage.

In case of reconstruction and special insurance, the average annual amount of expenditure that is likely to occur must be determined as closely as possible in the manner already described, but here no trust interest can be considered, for, while at times the fund may show an accumulation, at other times it may be negative, so that interest received at times of accumulation may be considered as offsetting interest paid during times of borrowing.

The accumulation of these funds is for specific purposes and the money should be used only for those purposes. Also, those purposes should be supported solely from these funds. Thus, when property must be replaced on account of its depreciation, the cost of doing this (less salvage on the discarded plant) should be defrayed out of the depreciation fund, and when an underground line must be substituted for a useful overhead pole line, on account of municipal legislation, only the difference between the first costs of the underground and overhead lines should become a capital charge, and the remainder of the expenditure (less salvage) should come from the accumulated funds.

The coming of public service commissions having power to regulate the rates of public service companies, has raised the question whether the depreciation of a plant should have an influence upon the earning power of the company. It seems patent that a company should be permitted to earn a fair return on a full, reasonable, unimpaired capitalization regardless of depreciation, so long as it supplies equally good service. This question would not seem to me to be open to doubt were it not sometimes a subject of serious discussion, and were it not that some respected publicists seem to hold that the net earning power of a public service company should be less after its plant has been subject to depreciation than when brand new, even if it gives equally good service and the stockholders have received back no part of their invested principal, but only fair returns in interest.

With a properly conducted property the fact that the property has suffered depreciation, which is unavoidable in any electric plant, should not have the effect of injuring the quality of its service or of impairing its capital, which would be the case if its recognized earning capacity were expected to decline proportionally with the increase of its depreciation fund.

There is another phase of depreciation I would like to touch upon before closing.

The tendency of today is to make sweeping changes in plant and methods, to permit of less expensive or of improved service. On this account many excellent plants in good operating condition are shut down and the requisite power received from other sources. A company cannot well charge off of its capital account the value of such plants which may be comparatively new when they are put out of commission. In fact, I have in mind a plant of 1,000 kilowatt capacity, which is of modern design with steam turbine-generators not over two years old, which with several other plants is being shut down owing to the possibility of obtaining power from another source at less cost than it can be produced in these plants. The question is, what should be done regarding the capital value of such plants? Unless it is necessary to retain the plants in reserve, I believe they should be dismantled and the capital of the company reduced by the amount received from the sale of discarded machinery and other property. Then the difference between the amount received from their sale and their actual capital value to the company may still be continued as a true asset of the company, and that value be gradually charged off at the normal depreciation rate of the plants discarded, the capital of the company being reduced each year by actual liquidation of that amount.

In conclusion I will say that, where electrical properties have been failures in the past, a goodly proportion of the failures may be traced to lack of provision for depreciation expenses and for extraordinary expenses. The reserve fund, besides covering such extraordinary expenses as are mentioned in the foregoing discussion, must be sufficient to care for losses occasioned by any recession of income which may come in the train of the physical results of the extraordinary occurrences discussed. The proper organization of a depreciation fund in conjunction with the reserve fund will also fortify a company against difficulties on account of reduced net earnings during lean years, which every company must expect, and which lean years will be offset by good years.

All of you will appreciate that it is impossible to figure the expenses considered in the foregoing to a high degree of exactness, but they may be figured logically and intelligently, and it may be said that a company which follows the principles here laid down regarding depreciation and reserve funds is likely to travel along an untroubled path so long as its field of operations provides sufficient earnings to warrant the company's existence.

In discussion of the paper C. N. Duffy, auditor of the Milwaukee Electric Railway and Light Company, spoke of some of the difficulties which had been met with in Milwaukee. The commission considered that the income was too large, but this would not have been the case, had depreciation been properly taken into account. Mr. Duffy stated further that depreciated property should by no means be considered a diminished investment. These is, at the same time, an objection to building up a depreciation fund on the sinking fund plan. It is practically impossible to set aside a definite fund each year.

George Weston, chief engineer of the Board of Supervising Engineers of Chicago, raised a question as to the manner of determining the percentage to be set aside annually for such a fund. As an estimate he stated that by his experience about six per cent of the gross operating expenses would take care of operating and repairs and eight per cent would serve for renewals.

Mr. Ubelacker, chief engineer of Ford, Bacon & Davis, contended that the importance of a reserve fund was much overestimated. It did not seem, he said, to be of such moment unless the true state of affairs was concealed. In some cases people might be made to think that they were getting full value for money invested when such was not the case. As long as a plant gives 100 per cent service it does not seem necessary to make a provision for supercession.

From the standpoint of a large operating company, E. J. Fowler, statistician of the Commonwealth Edison Company, spoke of some of the methods of providing for maintenance. Agreeing in part with Mr. Ubelacker, he stated that depreciation was often overrated. With appreciation of land, interest and long life of some of the property, the conditions tend to balance.

Harold Almert, of H. M. Byllesby & Company, criticized the small station manager for not upholding rates. When only running expenses and current repairs are considered, the profits increase so that a cut in rates is often made. If depreciation is taken into consideration this is often not warranted.

W. L. Abbott, of the Commonwealth Edison Company, remarked that he disagreed with Mr. Jackson on one point: namely, the life of electrical machinery. In the thirty-five years that he has been interested in the electrical business he has seen the equipment practically re-

placed four times. To this Mr. Jackson replied that he had merely stated the maximum life.

The refinement to which accounting was carried was briefly touched upon by John S. Allen, of Lake Geneva, Wis. No other business figures so closely as to profit, a fact which may be attributed to the public service commissions.

Franklin H. Reed, editor of *Telephony*, sent in a discussion which was in part as follows:

"Interest in this topic among operating men, at least in the telephone field, has greatly widened and increased during the past few years. A year ago last winter it was very keen in certain sections of our north central states at the time sleet storms were making their visitations. I recall one small company in Minnesota which preceded the addition of capital like a layer of wallpaper, which forms Mr. Jackson's apt analogy, by raising its rates twenty-five per cent after the wires tumbled down under a sleet load.

"There has been a tendency in the minds of some operating men to confuse the depreciation fund with maintenance expense. Maintenance expense is incurred to hold up the plant; the depreciation fund protects the investment. As long as inventive talent and organizing ability can command exceptional rewards, and real estate investments hold forth the possibility of unearned increment, the speculative element will enter into investments. Securities issued by public utilities will be obliged to offer a certain amount of speculative attraction in order to compete in the money market with other business.

"The public utility is peculiarly fitted to occupy the field of safe investment, owing to the slight liability to considerable reduction of income from any cause except bad management, and the steady and fairly regular expansion which accompanies the ever-increasing natural demand for its service, which constitutes a modern necessity. If a public service corporation accepts this view of its own investment standing it irrevocably commits itself to the principle that an investor in its capital is entitled to withdraw his investment at his option. The property must be so managed that the man who pays in a dollar can take it out, and be sure that he will be able to do so one or ten years hence. Then he will have the same confidence in the safety and accessibility of his money thus placed as he does when it is put in the savings bank. This principle is the foundation of the ethical and business status of the depreciation fund."

George W. Cravens took the stand that depreciation was more than a matter of bookkeeping and that it is necessary to see that investments earn dividends and are protected. In speaking further he referred to his article on "The Depreciation and Maintenance of Electrical Equipment," which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 23.

The vagueness of the terms maintenance and depreciation was touched upon by J. R. Cravath.

From the standpoint of the storage battery man there is no depreciation, a fact which was well brought out by Mr. Milton, of the Electric Storage Battery Company. In this case the current repairs take care of all replacement in the apparatus.

It was the good fortune of the members to hear from Ralph W. Pope, secretary of the American Institute of Electrical Engineers, who was present at the meeting. Mr. Pope spoke briefly of the work that was being done by the Institute and told of some of the branches which he had visited. He also spoke of depreciation in connection with the Engineering Societies building in New York city.

Mr. Jackson in summing up said that the most important thing was to differentiate between depreciation as a real fund and as a matter of mere bookkeeping. The books should show the exact conditions and money should be actually available when needed.

### Chicago Electric Club.

A series of reminiscences of the now historical litigations relating to the early inventions in the electrical industry, were recounted interestingly by Charles A. Brown, of Brown & Williams, Chicago, at the regular meeting of the Chicago Electric Club on Wednesday, April 27.

Mr. Brown referred to the days when the telephone and the telegraph were practically the only electrical apparatus known, and explained the interesting features brought out by the controversies between Alexander Graham Bell and Elisha Gray, Brush and Thomas A. Edison, and other famous inventors. He dwelt at some length upon the telephone case between Bell and Drawbaugh, in which the latter, a resident of Pennsylvania, after viewing the Bell patent at St. Louis, returned to his home and perfected an instrument similar in every respect. About one hundred and fifty persons in his neighborhood testified that Drawbaugh had his instrument in operation prior to that of Bell's, and it was only by a small majority that the Supreme Court avoided making an entirely unfair decision.

Another interesting litigation, namely, that between Brush and Edison, involving a compound wound dynamo, was described, and an interesting feature pointed out was the expense involved in submitting elaborate exhibits to the court.

Mr. Brown also spoke of the work of Field and Tesla in this connection and gave brief accounts of the litigations which invariably followed a great invention at that time.

At the conclusion of Mr. Brown's remarks, Secretary Hickok asked him in what connection Amos Dolbear figured in the early telephone patent cases. Mr. Brown said that Dolbear invented a specific type of telephone, and that he did not enter any claims for the early inventions of the regular instrument.

Upon the motion of Homer E. Niesz, president of the club, a hearty vote of thanks was extended to the speaker for his interesting address.

### To Form a Conservation Board.

Senator Newland's bill for the formation of a Conservation Board has been favorably reported by the Senate Committee on Conservation. It provides for the appointment by the president of a commission to consist of not more than fifteen persons, each of whom will be expected to serve for a term of not exceeding three years, for the purpose of examination into and reporting to Congress on all conservation problems, and with special reference to the conservation of the water resources of the United States for the purposes of navigation, irrigation, municipal supply, and power.

It is also proposed that the commission, if appointed, should co-operate with commissions or boards appointed by the respective states for similar purposes. F.

**The Missouri Electric, Gas, Street Railway and Water Works Association.**

The Missouri Electric, Gas, Street Railway and Water Works Association held its fourth annual convention at the Madison Hotel, Jefferson City, Mo., April 14, 15 and 16 last.

On Thursday morning, April 14, the electrical men visited the power house of the Missouri State penitentiary at Jefferson City, and were given a lunch by Warden Andrae, at which the regular prison fare was served.

The first session was called to order on Thursday afternoon by R. J. Irvine, first vice-president of the association, who took the chair in the unavoidable absence of President W. S. Bixby. An address of welcome was made by Mayor Heinrichs of Jefferson City.

Louis Friedman of the Chicago office of the General Electric Company, read the first paper entitled "The Luminous-Arc Rectifier System." The rectifier system for luminous-arc lamps consists of a specially wound constant-current transformer connected to a mercury-vapor rectifier immersed in oil. From this a constant direct current is supplied to magnetite arc lamps in series. Mr. Friedman stated that the maximum intensity of the luminous-arc lamp is at an angle of about ten degrees below the horizontal, thus making this lamp especially suitable for street lighting. Among the 50,000 magnetite lamps in this country, those comprising the downtown street lighting system of St. Louis were cited as one of the most conspicuous examples of this form of lighting.

The discussion brought out the fact that the entire street lighting of St. Louis will soon be changed over to the magnetite-arc system.

J. E. Harsh read a paper entitled "Securing Profitable Day Load," in which, among other things, he recommended central stations to pay more attention to the making of special contracts for loads which are limited to certain hours of the day.

This concluded the business part of Thursday's programme. In the evening an enjoyable smoker was held in the café of the Madison Hotel.

Chas. S. Lewis opened the Friday morning session with a paper entitled "Condensers For Small Central Stations" in which he strongly recommended a more universal use of condensing plants in the small central stations. A description of the design and methods of economical operation of condensers followed, and examples were cited showing very substantial gains in efficiency which had resulted in certain specified instances by the addition of condenser equipment.

In the discussion that followed, Prof. H. B. Shaw of the Missouri State University, stated that the cost of steam turbines begins to decrease very rapidly about the 500-kilowatt sizes, and that therefore turbines should receive more attention when the choice of a prime mover for a small central station was up for decision.

Following the discussion on Mr. Lewis's paper, N. J. Cunningham, chairman of the committee on accounting and records, gave an account of the work of his committee on the matter of depreciation and of the attempts to devise a plan which can be applied by all the companies within the state of Missouri in getting out their financial statements for the public-service commissions and for the income-tax assessments.

On Friday afternoon, Governor Hadley of Missouri gave an interesting address on the present and proposed public-service commission laws in the State of Missouri. The principal point brought out was the desirability of oppointing a state commission similar to those of New York and Wisconsin.

Secretary C. L. Clary, after the Governor had finished talking, stated how his company had been assessed at a ruinous rate by the local commission, probably on account of its ignorance of the electrical business, thus showing the need for a state commission of electrical experts, as advocated by Governor Hadley.

A paper on vertical gas retorts was then read by S. Watts, and an account of an electrically-driven water works at Mattoon, Ill., was given by H. W. Clark. The electrical operation of Mr. Watts' plant has been very successful, the coal consumption having been halved and the operating staff reduced from thirteen men to three.

Secretary Clary, in telling of his own experience with electrical pumping, stated that a charge of three and one-third cents per thousand gallons, as indicated by a flow meter, proved to be equivalent to the charge for current of about five cents per kilowatt-hour.

C. S. Lewis said that in his opinion the cost of triplex and centrifugal pumps would work out to be about the same, taking into account the higher efficiency of the one and the lower upkeep of the other. He further stated that even under the most severe working conditions, as when gravel and sand were being handled, the wear of centrifugal pumps was very slight.

George McCullom, in a paper entitled "Question of Public-Service Plant Operation and Management," discussed the electricity supply business from a legal aspect, and showed the advisability of electrical men endeavoring to take a hand in drafting any law affecting their business, so as to eliminate objectionable features before the passage of the bill. The author gave as his opinion that the new Federal income-tax law which levies a tax of one per cent on all incomes over $5,000 and which becomes effective June 1 next, is unconstitutional. This law is now up before the courts at Washington.

On Friday evening a most enjoyable banquet was held at the hotel.

On Saturday morning Prof. H. B. Shaw gave the first paper, which was entitled "Data on Electric Plants," This paper was an admirable attempt to get together in one treatise the available data on central station operation.

The last paper of the convention was by Edwin S. Harrison on "The American Diesel Oil Engine in Public Service."

The following officers were elected for 1910: R. J. Irvine, Marshall, Mo., president; F. E. Murray, Louisiana, Mo., P. A. Bertrand, Jefferson City, Mo., and J. E. Harsh, Joplin, Mo., vice-presidents; and N. J. Cunningham, Springfield, Mo., secretary and treasurer.

**All Space Sold for the St. Louis Exhibition.**

The Exhibition Committee of the National Electric Light Association announces that all the exhibition space for the coming convention at St. Louis has been sold. Indications are that this exhibition, to be held from May 23 to May 28, will be the most successful as well as the most beautiful, held in the history of the Association.

The decorative scheme includes a complete transformation of the interior of the Coliseum, and the yellow and white color scheme that has been adopted will furnish an excellent setting for the various types of apparatus exhibited.

**Commission News from New York.**

The New York State Public Service Commission, Second District, has granted the application of the Hudson Valley Railway Company for approval of a high tension line constructed from the steam electric power plant of the Delaware and Hudson Company in the town of Half Moon, Saratoga County, to the car barn and substation of the United Traction Company in the city of Troy. The approval is made on condition that at all highway crossings at which the poles adjacent to crossings are not double armed the poles shall be double armed before the first day of June, 1910.

The Commission has authorized the Deer River Power Company, of Watertown, N. Y., to execute a mortgage upon all its property to secure a total issue of $200,000 par value six per cent twenty year gold bonds. The company is authorized to issue at present $67,000 par value of the bonds to be sold at not less than 90, the proceeds to be used for the payment of obligations incurred by the company in developing power and generating electricity on the Deer River at a point known as High Falls and at various points above High Falls. It is the purpose of the corporation to develop power and generate electricity to be furnished in the village of Copenhagen and persons and corporations in the county of Lewis and to furnish and sell power and electricity in the county of Lewis and other adjacent counties and to such individuals and corporations as it shall be able to make contracts with.

The Commission has also authorized the Thousand Island Electric Light and Power Company doing business at Clayton to issue $20,000 mortgage bonds at not less than 95, proceeds to be used for the payment of obligations and improvements and extensions to its plant.

The Commission has authorized the Conant-Bryant Power Company to exercise franchise for electric lighting service in the village of Wilson, Niagara County. The franchise is held by Stuart M. Conant and Russell W. Bryant and the order authorizes them to transfer it to Conant-Bryant Power Company.

The Utica and Mohawk Valley Railway Company announces that, following the recommendations of the Commission, it intends to purchase four interurban cars of the same type as those now running on the Rome-Little Falls division, which will be equipped with multiple unit control, so that they can be operated in trains; also four double-truck cars with larger seating capacity than the present double truck cars, which will be operated on the Herkimer, Mohawk, Ilion & Frankfort division.

**Ralph W. Pope Addresses Lewis Institute Branch of the American Institute of Electrical Engineers.**

The Lewis Institute Branch of the American Institute of Electrical Engineers was especially fortunate in having Ralph W. Pope, secretary of the American Institute of Electrical Engineers, at the April meeting held in the Lewis Institute auditorium on April 27, 1910. Secretary Pope addressed the students on the "Education of the Electrical Engineer." The speaker brought out many points which controlled in a large measure the ultimate success of an engineer, making special mention of the necessity of having a thorough knowledge of the English language, its punctuation and pronunciation. Mr. Pope cited many humorous incidents in connection with the publication of the Proceedings of the Institute, causing many outbursts of laughter from the two hundred and fifty members and students assembled to hear him. The meeting was a success, and it is hoped that Secretary Pope will be able to visit the branch again in the near future.

**Winnipeg Electrical Show.**

The second "Electrical Show" of Winnipeg, Can., is to be held from July 13 to 23. In the future this electrical exhibit is to be a regular feature of the Annual Exhibition of the city of Winnipeg.

The Winnipeg Industrial Bureau is planning the exhibit and intends to form a large and permanent exhibition of western manufactured and natural resources, and negotiations are pending for securing 10,000 square feet of floor space near the city hall for this purpose.

**Illinois Traction Building for St. Louis.**

Plans have been made by the Illinois Traction System for the construction of a $1,500,000 office building and depot at St. Louis. The plans include the constructions of a modern block, fifteen stories high.

**Southern Power Company to Entertain Manufacturers.**

Following the fourteenth annual convention of the American Cotton Manufacturers' Association, which will be held in Charlotte, N. C., May 17-18, an excursion will be made to the Great Falls station of the Southern Power Company. At the plant 32,000 horsepower of electricity, used by the cotton mills and other industries of the section, is developed. The Southern Power Company will furnish the train and be host for the trip.

**Metropolitan Reorganization Plans at a Standstill.**

Reorganization plans of the Metropolitan Street Railway System of New York city are at a standstill, owing to differences of opinion among factions of the security holders.

These differences are chiefly because the holders of the two classes of bonds, namely the $12,500,000 collateral 5s and the $16,604,000 refunding 4s, cannot agree as to the relative value of the two securities.

**Detroit Industrial Exposition.**

The Detroit Industrial Exposition, which will be held at Detroit, Mich., from June 20 to July 6, will include among other things an electrical show. It is the purpose of the Board of Commerce, which is giving the exposition, to give visitors a better idea of the many industries of the city. For the purpose of advertisement a monthly bulletin is being published.

**A Sign of the Times.**

The firm of Gimbel Brothers, of Market and Eighth Streets, Philadelphia, will make a new departure in its new store at Sixth Avenue and Thirty-third Street, New York city, shortly to be opened. No horse-drawn vehicles of any kind will be employed in making deliveries, all of which work will be performed by seventy electric delivery wagons and trucks.

**To Look for Wireless Disturbance from the Comet.**

All government wireless stations have been asked to look for disturbances on May 18, when the earth passes through the tail of Halley's comet. Prof. O. C. Wendell, of the Harvard Observatory, regards this as a useless precaution. He states that there is little probability of disturbance.

### Waterpower Discussion in New York.

A question of acquisition of water power by Cohoes Company for the purpose of generating power to operate many Cohoes mills, is at present agitating the New York Legislature. Recently a bill was introduced authorizing the Cohoes Company to make use of the waters at the Crescent dam, across the Mohawk River, adjacent to the Cohoes Falls. The reason given for the birth of the bill was that the construction of the state barge canal took away from the company in question much of its water and left it incapable of supplying the necessary power to the companies relying upon it for such power.

The granting of the rights in question is opposed by state engineer Frank M. Williams on the grounds of state policy. The state engineer is of the opinion that no water created by the barge canal should be disposed of except under a general law which would cover all cases.

Regarding the Cohoes Company's proposition, State Engineer Williams says:

"I believe that such powers should be disposed of under conditions which will permit of competitive bidding so that the state may receive for its natural resources, developed by the expenditures of the state's money, an adequate return for its investment, and that these resources so developed may accrue to the benefit of all the people of the state rather than to one or two individuals or corporations.

"I further believe that the powers thus created should not be disposed of except under lease for a limited period of years.

"The state should not be placed in a position to lose by insufficient installations and by improper maintenance and operations of the power plants. I have not attempted to name a value for the water power in question at this time, as it seems to me the price could be best determined by the offer of the highest bidder in open market."

### New Engineering Building for Union College.

The new engineering building of Union College at Schenectady, N. Y., was recently opened with elaborate exercises. This building is in part the gift of Andrew Carnegie, who gave $100,000 on condition that an equal sum would be raised by the alumni of the school.

### Public Securities Company Organized in Chicago.

The Public Securities Company has been organized and will open a banking house in Chicago. The company, which has a capital of $20,000,000, will occupy a position in Chicago corresponding to some extent to that of the private banking houses of New York and other eastern cities in the financing of railway, traction, gas, electric, hydroelectric and timber properties.

The board of directors elected is as follows:

Horace G. Burt, Chicago, formerly president Union Pacific Railway Company; Samuel Insull, Chicago, president Commonwealth Edison Company; B. E. Sunny, Chicago, president Chicago Telephone Company; Edward G. Cowdery, Chicago, vice-president Peoples Gas Light and Coke Company; Thomas E. Mitten, Chicago, president Chicago City Railway Company; H. M. Byllesby, Chicago; Clark L. Poole, Chicago; Walter Barker, Peoria; John W. Blodgett, Grand Rapids, Mich.; Frank H. Buhl, Sharon, Pa.; James E. Danaher, Detroit; M. D. Thatcher, Pueblo, Colo.; Homer W. McCoy, Chicago; Charles H. Deppe, Chicago; Walter A. Graff, Chicago; Joseph H. Roy, Chicago; H. H. Picking, East Orange, N. J.

Officers of the company have been elected as follows:

Homer W. McCoy, president; Charles H. Deppe, vice-president; Walter A. Graff, vice-president; Joseph H. Roy, secretary and treasurer.

### Forty-Second Street Line Sale Adjourned.

Judge Lacombe granted an order further adjourning the sale under foreclosure of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company, New York city, by Edward H. Childs as special master from May 16 to June 6. In the petition asking for the order of the court it is set forth that bonds to the amount of $1,460,000 secured by a mortgage of the company's property were sold under the decree of foreclosure of the Third Avenue Railway Company's property, and that the plans of reorganization of that company under consideration by the New York Public Service Commission will take a little more time, and it is said by all concerned that the best interests of the Forty-second Street line will be conserved by the adjournment.

### London Banks Not All Telephone Users.

It may read to American readers rather curiously, says a London (England) subscriber of *Telephony*, that London banks are not on the telephone, and the only way you can telephone to the bank manager is to send him a telegram and ask him to come out and call you up from a public pay station. One would have thought that banks would by this time have perceived the necessity for proper telephonic conveniences between themselves and their customers. The notorious "D. S. Windell frauds" of last year were rendered possible owing to the lack of communication by telephone between the various London branches of the bank that was plundered. We, of course, all know that there may be certain disadvantages for a bank to be on the telephone, but the fact that some of the leading banking institutions are connected by telephone seems to show that the balance of the banks are in its favor.

### Utah Society of Engineers.

At the fourth annual meeting of the above society two electrical papers were presented—"Hydroelectric Development," by Leonard Wilson, and "Power Plants in Utah," by Owen H. Gray. The following officers were elected for the ensuing year: President, O. A. Honnold; first vice-president, C. H. Repath; second vice-president, F. E. Arnold; secretary, W. C. Ebaugh; treasurer, B. F. Tibby.

### Wireless Instrument Hearing.

The Senate committee on commerce gave a hearing on the Depew bill, regulating the use of wireless instruments. W. E. D. Stokes, Jr., and George Eltz, representing the Amateur Wireless Club, protested against the bill. Three wireless companies, United, National Electric Signal, and Marconi, were also represented at the hearing; also representatives of the government department.

Reports from Chico, Cal., state that the Sacramento Valley Power Company has brought its lines from Shasta County to enter into competition with the Pacific Gas and Electric Company and the Northern California Power Company for the electric light and power business of superior California towns.

# CENTRAL-STATION PRACTICE

## Transmission—Interior Wiring

### WATER-COOLING PLANT AT THE SALFORD ELECTRICITY WORKS.[1]

DESCRIPTION OF THE PLANT AT AN ENGLISH CENTRAL STATION.

When there is no river or other natural source of supply of water for condensing purposes, the means for cooling the condensing water is an extremely important part of a central-station system. The following description is of a $60,000 plant recently installed at the Salford (England) Electricity Works, which is one of the largest of its kind in England, and possesses several new features of interest:

The pumps for raising the hot water to the top of the cooling towers are installed in a separate building adjacent to the towers themselves, and the whole plant shows evidence of most careful design and forethought for all possible emergencies.

The works are situated at Pendleton, Salford, between two locks about a couple of miles apart on the Manchester, Bolton and Bury Canal, and for some years have been using the canal water for both condensing purposes and for the feed water. There are other smaller works using the water along the same reach, and a year or so ago it was discovered that the water was being taken in at a temperature of over eighty degrees Fahrenheit, which sometimes reached even 100 degrees, and discharged at 140 degrees, whereas the figure for the discharge temperature according to the agreement with the Lancashire & Yorkshire Railway Company, the owners of the canal, was ninety degrees Fahrenheit. Further, the railway company and the large owners began to complain, as in certain weathers the steam on the surface of the water extended for about a mile along the canal, and the water was so hot that it brought out the pitch from the seams of the barges. The canal water is also dirty.

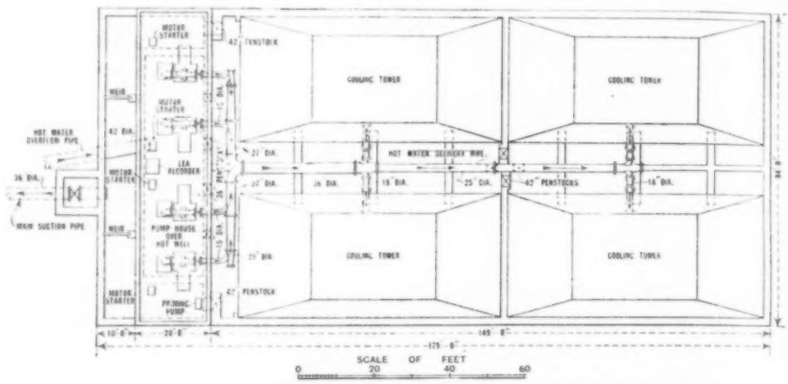



FIG. 1.—GENERAL ARRANGEMENT OF WATER-COOLING PLANT

FIG. 2.—GENERAL VIEW OF TOWERS AND PUMPHOUSE.

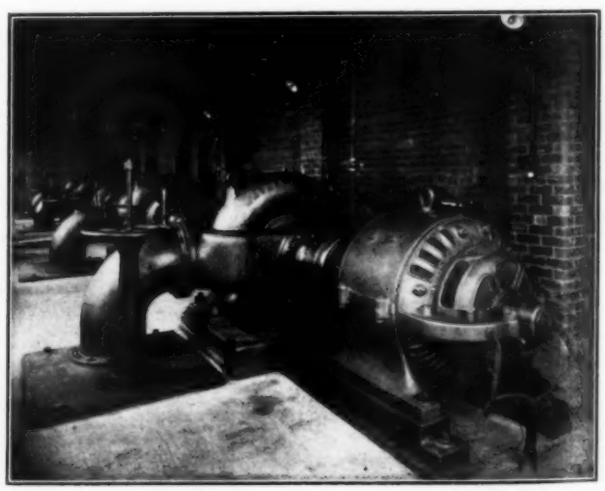


FIG. 4.—SIXTY-HORSEPOWER PUMPING SETS.

It was therefore decided to drop the contract with the canal company and to erect a cooling-tower plant to deal with the condensing water, and as 750,000 gallons of water has to be circulated per hour at full load, it will be seen that the pumping plant, as well as

[1] Abstracted from *Electrical Engineering*, London, England, February 24, 1910. The photographs from which the halftones were reproduced were furnished by Balcke & Company, Ltd., the contractors for the work.

the cooling towers themselves, is of considerable magnitude.

The general arrangement of the new cooling plant, the main contractors for which were Balcke & Company, Ltd. (27 Clements Lane, London, E. C.), is shown in Fig. 1. A forty-inch diameter discharge pipe from the nine condensers (eight of which are jet, and one surface) is led into a hot-well tank under the pump house by the towers, and the water is pumped from there by four motor-driven centrifugal pumps up to the distributing troughs in the four cooling towers. The towers themselves are illustrated in Fig. 2, and are of Balcke & Company's natural-draft chimney type, each tower being capable of dealing with 187,500 gallons of water per hour. They are constructed entirely of wood, and consist of tapering rectangular towers built on concrete foundations with tanks below for receiving the cooled water.

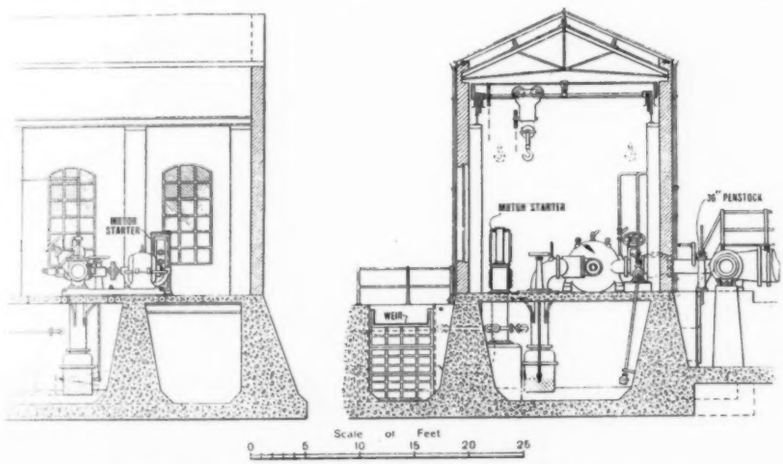



FIG. 3.—PARTIAL ELEVATION AND SECTION OF PUMP HOUSE.

The cooling apparatus proper is built into the lower part of the tower, and consists of wooden distribution troughs, splash plates and cooling hurdles, by which the incoming warm water is divided up into minute drops and brought into the closest possible contact with the air entering from below. The cooling effect is obtained partly by evaporation and partly by conduction of heat to the air. Each tower is seventy-five feet in height, and the water is delivered into the tower at a point some twenty-two feet above the top of the tank, the remaining fifty-three feet of chimney providing the necessary draft.

Under the present conditions, the water enters at a temperature from ninety to 100 degrees Fahrenheit, and is cooled by its passage through the tower to sixty-five degrees. The result of these better water temperature conditions is an appreciable rise in vacuum which naturally results in economy in fuel. The towers are unusually wide, about thirty-three feet at the bottom, and, to insure that the incoming cold air reaches the water in the center, the lower part of the tower is divided into four, stead of two, vertical sections, and a supply of cold air into the inner sections is effected by means of special diverting plates in the air duct below. The outer structure is of pitch pine incased with red-deal boards, both creosoted under pressure, but the distributing troughs and cooling baths are of red deal uncreosoted. All steel and iron parts, such as the splash plates, washers, bolts and nails are galvanized. The four towers are guaranteed to be able to cool 750,000 gallons per hour continuously from 115 degrees Fahrenheit, to eighty degrees, with an air temperature of fifty-five degrees, and a humidity of seventy-five per cent.

Between each two of the four concrete tanks below the towers is a hand-operated thirty-six-inch penstock, so that any one tank can be isolated for cleaning. The water runs away through two forty-two-inch penstocks into the suction tanks, and from these over two weirs into the thirty-six-inch cast-iron pipe to the condensers. The main valve in this pipe is situated in a concrete pocket at the suction tank end, and is operated by worm gearing. There are two pipes with forty-two-inch penstocks between the hot-well and the cold-water tanks for "short-circuiting" the pumps and towers should that be necessary. The weirs in the suction tanks are also provided with by-passes controlled by twenty-four-inch penstocks.

The four pumps are of Mather & Platt's patent high-lift turbine pattern, with specially designed guides on the cast-iron body, allowing the water to leave the impeller and to enter the whirlpool without shock. The impeller is of the double-suction type keyed to a manganese bronze spindle. Each pump is designed to deliver 250,000 gallons per hour, against a total head (including the ten feet suction and the calculated friction in piping) of thirty feet, when running at a speed of from 450 to 500 revolutions per minute. The bearings are exceptionally long. Water-sealed glands are fitted where the spindle passes through the pump covers to prevent air leakage. Each pump is driven through a leather flexible coupling by a Mather & Platt sixty-horsepower, 460-volt, direct-current, four-pole, shunt motor. The couplings prevent any strain on the shafts should they come slightly out of alinement. The general arrangement of the pumps and pipework is illustrated by Fig. 3, which is a section and a portion of an elevation through the pump house.

The motors are supplied through one of two independent circuits from the main switchboard which lead to a link changeover board in the pumphouse. From this board the leads are taken in steel conduit under the concrete floor to the motors and starting pillars. Each of the latter includes a starter with an interlocked shunt field rheostat, a double-pole switch with overload release, and an ammeter, all inclosed in a glass-fronted cast-iron pillar. These and also the motor frames are earthed to the conduit. The meters for registering the consumption of the pumping plant are on the main works power board. The surface wiring is carried out in steel conduit, and a wall plug with a length of protected cable and a hand lamp is provided for each set. An eight-ton manually-operated overhead crane travels the whole length of the house, and is employed for lifting the bend, foot-valve, and rose on the suction side for cleaning. The height of the crane is such that the rose can be raised ten inches above the floor of the pump house.

The two weirs shown in Fig. 1 are in parallel, and either can be connected by means of three-inch valves with the float chamber of a Lea (rectangular notch) recorder which is situated in the pump house, and measures and records the rate of flow over either or both. The pumps deliver into a common riveted mild-steel pressure main with bends and tees of cast iron. Between each pump and the mains are a double-flange fifteen-inch sluice valve and an automatic back-pressure valve for preventing the water returning to the hot-well and running the pump as a turbine should the motor fail. The back pressure valves also have hand-wheels for manual operation. Between each tower and the delivery main is a cast-iron pipe with two eighteen-inch sluice-valves. The total amount of make-up water required is about 80,000 gallons per day. At present this is taken from the canal, and is treated with soda-ash and lime in a softening tank which also acts as a settling tank for the mud, etc. As has already been mentioned, however, the canal water is very dirty, and an artesian well is therefore being sunk to supply the make-up water instead. The boring arrangements can be seen in Fig. 2. The pump for the make-up water will be electrically driven. It will be placed at the end of the pump house, the temporary end of which will be removed and the house extended. The lifting capacity of the pump will be 15,000 gallons per hour from a depth of 300 feet.

The generating plant of the station consists of eight Browett, Lindley compound tandem vertical engines, driving Mather & Platt 750-kilowatt direct-current generators and one Brown-Boveri—Willans-Parsons 1,000-kilowatt direct-current turbo-generator running at 1,250 revolutions per minute. The traction load is dealt with by some of the slow-speed vertical sets, while the lighting and power load is taken by the remaining slow-speed sets and the turbo-generator. The total capacity of the station, excluding some small motor-driven alternators for a separate supply, is 7,000 kilowatts. There is a small battery and balancer for equalizing the three-wire distribution systems, and a larger battery to assist with both lighting and traction loads with a capacity of 3,200 amperes on a one-hour rating is now being installed.

The whole of the work was intrusted to Balcke & Company, Ltd., and was carried out to the plans of V. A. H. McCowen, Borough Electrical Engineer, Salford. *Electrical Engineering* expresses its thanks to H. J. Hawkins, Deputy Borough Electrical Engineer at Salford, for assistance in preparing this article, and to W. Maudsley, Clerk of Works for the above new works, who kindly showed its representative over the plant.

### The Luminous Radiator and the Open Fireplace.

The following interesting letter, and a photograph from which the accompanying illustration was reproduced, have been received from George B. Johnson, manager of the exhibition room of the Commonwealth Edison Company, Chicago, Ill.:

"I notice in your issue of April 23 an editorial entitled 'One Method of Smoke Abatements,' which is of special interest to me, because it so ably advocates the use of the luminous radiator as a substitute for the open fireplace. We have encountered a number of cases where houses were heated by means of steam or hot water, but the open fireplace was also used on account of its cheerful aspect and for architectural and aesthetic reasons.

"In such cases, where heat is not desired and an exact imitation of an open fire is preferred, we have installed electrically operated fireplaces. The enclosed is a photograph of one of these fireplaces. This is in use in a German restaurant, and is very effective. The pieces of wood are illuminated in such a way that it is almost impossible to detect that a real fire is not burning. This is accomplished by means of lamps placed inside of the imitation wood and glowing embers, and flashers are so arranged as to make the firelight flicker and flare.

"In installing these, great care must be taken to keep the flashing effect from being the predominant feature. The arranging of the equipment is a particular job, and as the individual tastes of the customer must be carefully considered, we install these only on special order."

It will be noticed from the illustration how closely the "electric open fireplace" resembles its equally cheerful but dirty and bothersome progenitor, the deception being carried so far as even to include the familiar fireirons which are seen stacked up on the hearth to the right. There would seem to be a great future for the "electric fire," and now that a commercial start in this direction has been recorded, other central stations will follow the good lead of the Commonwealth Edison Company.

LUMINOUS ELECTRIC RADIATOR FOR OPEN FIREPLACE.

### Municipal Plant Rejected.

The city council of La Crosse, Wis., has rejected the proposition for a municipal lighting plant recently favored by a large majority in a referendum vote at the last city election.

The Court of Appeals of New York recently declared constitutional the Northrup law passed two years ago limiting hours of employment of railroad telegraphers and certain other employes having to do with the movement of trains, to eight hours in any twenty-four-hour period.

**Extensions and Improvements of Company Properties.**

In the April, 1910, issue of the Denver Company Section *Bulletin* of the National Electric Light Association, J. T. Brady, treasurer of the Denver (Col.) Gas and Electric Company, contributes the following article on extensions and improvements of the property of public service corporations:

"As the business of a corporation expands extension of its service into the growing districts become necessary in order to keep pace with the progress of the city. New mains must be laid and pole lines extended wherever the business taken on justifies the expenditure which is necessary for these extensions.

"The policy of the Denver Gas and Electric company is to extend its service a distance of 100 feet to supply any one consumer, without charge. For the service, however, which must be introduced into the premises from the mains a charge of $10.00 is made for any service not in excess of sixty feet, and a loop charge of $3.00 and $5.00 for the electrical connection. Where more than 100 feet of extension is necessary to supply a consumer the excess must be paid for as a construction cost by party desiring the service, and his bills for current or gas consumed will be deducted from this payment, which is placed to his credit, for a period of one year, or within the year, until the amount is exhausted.

"This is the general rule regarding extensions. In addition to extending our service for individual cases we are frequently called upon to figure on supplying an outlying district, where business can be taken on after running the service distances of several hundred feet, through which little or no return is obtained until the more thickly populated district is reached. As an illustration I might mention University Park, Elyria and Globeville, where it is planned to extend the gas service during the coming summer. Extensions of this nature require a big outlay of money, and it is two, three and sometimes four years before the company begins to receive any returns on the investment. However, public policy demands that, wherever it is possible to reach a given locality which is desirous of receiving the benefits of our commodity, that we be liberal from the standpoint of the expense occasioned, and make the extension, even though it may take a long time to be reimbursed.

"The point which I desire to bring out here is the capital which must be available at all times for keeping pace with a growing community, and the fact that on much that is invested there may be no adequate return for some time in the future. The public, in criticizing a corporation, never stops to consider this feature in the proper light, nor to consider, even, the amount which is invested in a single installation. We have many unprofitable consumers on our books today, who burn only the minimum on their electric light bills and only small amounts on their gas accounts, and some of whom require about two years to repay the company at that rate for the cost of their initial installation. Yet these small consumers are often the most difficult to satisfy, and the very ones who lift their voices the highest in denunciation of our methods when a slight increase in their bills is noted or when a question of the rates charged is being publicly discussed.

"What we desire most, and what we wish to accomplish at almost any price, is to secure and to retain the good will of our patrons. This is undoubtedly the most valuable asset a public service corporation can possess. It is obvious, however, that to make this good will of a permanent value we must carry on a continual campaign of education, coupled with that everlasting disposition to please by courteous and fair treatment. This education should embody a good, clear explanation of our methods, together with logical and sound reasoning regarding their fairness. It never avails us a particle—rather it reacts upon us unfavorably in the long run—to state anything but the exact truth regarding the cost to a consumer of the service he desires. If he understands that a certain outlay of money is necessary for an installation he plans on spending that amount only, and he expects his bills to be in proportion to the estimate given. By reasoning with him, showing him that the company's installation charges are based upon figures which admit of no profit whatever, and that the principal object we have in view in securing his business is for the future return on the money we are investing, his good will is gained at the outset, and the first impression counts a great deal in the business of supplying the public.

"In both our gas and electric departments estimates are called for by the manager towards the close of each year of the amounts which the superintendent of these departments would recommend for appropriation for improvements and extensions. As near as possible we anticipate the demands upon us in the way of facilities for supplying the service required for many months in advance, and make preparations to take care of it accordingly. The extension of our service in all parts of the city to supply new consumers means a constantly increasing demand on the central-station and holder capacity, with the result that the generating apparatus must be adequate to meet the increase.

"In a community which has experienced a very rapid growth such as our city has during the past few years considerable attention is necessary to keep the supply equal to the demand, and the standard of the service must be maintained at all times."

**Advertising the Electric Automobile.**

In the interests of getting new business for central stations throughout the country, the Electric Storage Battery Company, of Philadelphia, is sending out a booklet on "Undeveloped Central Station Business."

A number of the larger central stations have been active in advertising electrical vehicles and some of the sample advertisements of these companies are incorporated in the booklet. For the information of central station managers a brief description is given of several electric vehicles manufactured by the principal electric makers.

For some time the Electric Storage Battery Company has been a prominent advertiser in some of the leading periodicals. In these advertisements especial note is made of the fact that fully ninety per cent of all electric vehicles use "Exide" batteries.

The company will continue this advertising campaign in the papers, and is also preparing to issue advertising booklets to central station managers from time to time.

Exports of copper for the week ended April 28 were 3,088 tons. Since April 1 they were 12,422 tons, compared with 27,933 tons the same period last year.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

## THE DISTRIBUTION OF ARTIFICIAL LIGHT.[1]—I.

BY FRANK MARSHALL SCANTLEBURY.

The subject of illumination by artificial means is of vital importance to everyone interested in the advancement of prosperity. Prosperity because the welfare of our nation is based upon its commercial standing among the nations of the world, upon the ready market for all its products and the ability to supply the best the world can produce. This is especially true with our textile industries which at the present time lead the world in the amount and quality of their productions.

It is undeniable that the light in the textile mill of today is of greatest importance. If we compare the modern mill with its present day weave shed and the stuffy weave room of the past we find a great difference. In the former, we will find that not only the sides of the building are literally one sheet of glass but the roof is constructed fifty per cent of ground glass, allowing just as much light to enter as possible, with the result that the interior is as bright as the average greenhouse. In the old shed the aim seemed to be to crowd as many looms into one building as possible. Therefore, you will find in mostly all the older buildings three and four stories high and in certain sections so dark that artificial light is necessary at all times.

Perhaps the most surprising thing in this connection is the apparent disregard of artificial lighting and the crude methods in existence in some of the big mills. It would surprise a good many people were they to know, that some fifty large mills are using gas for illumination in New England alone, and were we to stop and consider that, with the improvements recently made in the electrical field, they could not only secure a much better light but could increase their efficiency fifty per cent at a saving of about twenty-five per cent in dollars and cents over gas, it will be difficult to understand why the illumination of yesterday is still in existence.

There are, however, mills which monthly sacrifice thousands of dollars through sheer waste of illumination. It is a safe estimate that some $20,000,000 worth of illumination is wasted yearly in the United States alone, not as we might suppose by neglecting to extinguish the lights that are not in use or in other ways, but rather by the failure to control illumination.

In industrial fields the lamp most generally used is the old carbon and of this type the sixteen-candlepower style predominates. The current consumption of this lamp figured in watts which is the term used to measure the electrical energy necessary to produce light, is 3.5 watts per rated horizontal candlepower. Therefore, if this lamp produces sixteen candlepower the amount of current it requires is fifty-six watts, 1,000 watts equal one kilowatt, and the rate for a kilowatt-hour varies from three to fifteen cents.

The Gem lamp is an improved type of the carbon lamp, having, however, instead of a carbon filament a carbon filament heated to such a degree in an electric oven that it takes on the properties of metal and hence the name, Gem "Metalized Filament." This lamp requires but 2.5 watts of electrical energy to produce one rated horizontal candlepower and it gives out a good, strong, white light. About two years ago the tantalum lamp made it appearance on the market. This lamp was named after the metal that constituted its filament, the filament being spun on what is known as a tree, supported by a glass pole. This particular type of lamp had the advantage of consuming but two watts of electric energy to produce a candlepower and in addition to this was a very strong lamp and would stand a great deal of hard usage. This latter feature, however, was only true when the lamp was burned on a direct-current line and experiments showed that the filament would not stand the alternating-current line in a satisfactory way to any extent whatsoever. This lamp had hardly had an opportunity to become a popular addition to the commercial world before the tungsten and Mazda lamps made their appearance. In both these lamps we find the very highest developments in the electric lamps of the present day. They give perhaps the whitest and best artificial light that has ever been discovered next to acetylene gas. For comparing color values the light given by these lamps is superior to all others as they show up color values, when used in conjunction with a good reflector, almost equal to daylight. Perhaps the most surprising thing is the low consumption of current necessary for them to produce light, they requiring 1.25 watts, or less, per candlepower. The popularity of these lamps among the textile trade is increasing daily, and it is safe to say that the day when they will replace the carbon lamp is not far off.

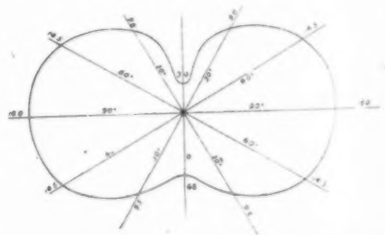


FIG. 1.—PHOTOMETRIC CURVE OF BARE SIXTEEN-CANDLEPOWER LAMP.

Illumination, however, and light, are two distinct and separate things. For instance, a room may be well lighted but poorly illuminated. Light is the cause, illumination the effect, and unless we control our illumination we are virtually throwing money away.

For example, the carbon lamp of the fifty-six watt type used in most our

[1] Abstract of a paper read before the National Association of Cotton Manufacturers, Boston, Mass., April 28.

mills is termed a sixteen-candlepower lamp, and by sixteen candlepower we mean that directly off the horizontal we are getting sixteen candlepower while directly off the end of the lamp our end on candlepower amounts exactly to 6.5 candlepower. In Fig. 1 we have what is known as a photometric curve of a bare sixteen-candlepower lamp.

It will be noticed that directly beneath this lamp we get the second smallest fraction of our light, six and five-tenths candlepower, and it is directly beneath the lamp in almost every instance that we require our best light. This fact is generally known and to remedy it a flat enamel reflector, usually the cheapest tin reflector made, is placed directly over the light. The results obtained by doing this is to redirect three candlepower into the horizontal and does not result in building up the end on candlepower to any appreciable extent. Illumination can be concentrated or spread over a large area in exactly the same manner as water in a hose. If concentration is required, a reflector made of glass prisms produces astonishing results, and this system so positively controls the light rays that almost any distribution or concentration can be accomplished by its use. This principle of the control of illumination by glass prisms is based on the discoveries and experiments of Blondell and Psaroudaki who originated the system. In all highly polished surfaces there exists what is known as a critical angle of reflection. This may be illustrated very easily by a clear piece of glass or any bright surface if it is held on an angle of about forty-five degrees beneath any artificial light, an image, or in other words, a reflection of the light source will present itself to the eye. In the case of reflection by the aid of prisms as shown in Fig. 2, the light leaves its source *A*, and enters the prisms at *B*, strikes the critical angle at *C*, and from there is reflected across to point *D*, this being a critical angle reflects the light back again to *A*. It can, therefore, be readily seen that by keeping the angles of the reflector the same uniform size throughout its entire length and by curving them the spread and distribution can be regulated according to the requirements.

The use of glassware, however, in some cases is not advisable owing to the possibility of breakage, and the effort to discover an opaque reflector of strength and efficiency equal to the glass reflector has been the constant aim of all interested in better illumination. This is, however, a very difficult problem and it is doubtful whether this will ever be accomplished.

One of the most durable and efficient propositions in opaque reflectors on the market today is one that has gained its entrance into hundreds of the foremost mills in the country. This reflector embodies all the very latest developments in the science of reflection and vies with the prism-glass reflector in the control of light. It is constructed of steel spun into shape by hand over a wooden chuck which is scientifically considered to have the correct curves and to possess the shape best adapted for control of light. The spinning process has the effect of leaving the interior surface porous and when the reflecting surface, which is of absolutely pure aluminum, is applied, it is annealed in such a manner that the aluminum works itself into the porous places and gives us a reflecting surface which is known as a "mat or satin finish." This is perhaps the finest reflecting surface known, for in addition to its reflecting a very strong light, it is claimed to have the added advantage of being able to whiten the yellow rays of a carbon lamp to a very large extent and also diffuse them.

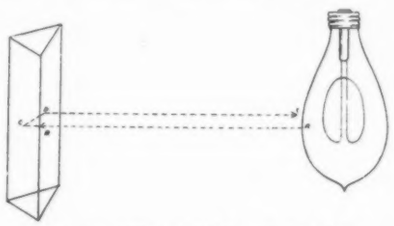


FIG. 2.—REFLECTION BY PRISMS.

The best illumination given forth from an opaque reflector is that given from an irregular reflecting surface, in other words, a surface that will break up and scatter the light rays while reflecting them. If we will examine the reflection given by a polished reflector we will find that there exists what is known as streaks and striations, and while these may not appeal to the laymen as being particularly objectionable or harmful, if we will take the trouble to investigate the result that they have upon the eye we will find that it is of vital importance that they be eliminated. Upon examination we find that the eye is equipped with a very delicate member that closely resembles the shutter of a camera. This member is known as the iris and its purpose is to regulate the amount of light that is admitted into the eye. Now, if we will examine these streaks in our reflection, we will find that there are light and dark spots. Imagine then, for example, a condition existing where there is the least vibration. The result is that back and forth over our work we have these striations continually moving. The eye must follow and adjust itself as each light and each dark spot passes in front of it. It is possible for this to continue for perhaps an hour but eventually it is unable to keep up and the result is that the eye is severely strained. Long continued, this results in permanent injury. The eye cannot see as well as it did at first, consequently defects in material are allowed to pass unnoticed, and we look at our spoilage and wonder why the amount is greater during the seasons of lighting than it is at other times. If this one small point were investigated it would be found that poor reflectors were responsible for at least one-quarter of the spoilage. Good light means good work, and the man who tries to economize at the expense of his operatives' eyes finds that it is a very unsatisfactory method.

(To be continued.)

### Street Lighting in Los Angeles.

At a recent meeting of the trustees of Los Angeles, Cal., a contract for lighting the city for five years was closed with the Southern California Edison Company. It provides for 250 fifty-watt tungstens and seventeen arc lights. This is an increase of 140 incandescents. For a couple of months two blocks of North Bright avenue have been lighted by the new tungstens as an experiment, with such satisfaction that the increased service is ordered. The new contract is for $1 per month for the tungstens and $5 per month for each arc.

### Modern Lighting for Allentown (Pa.) Furniture Store.

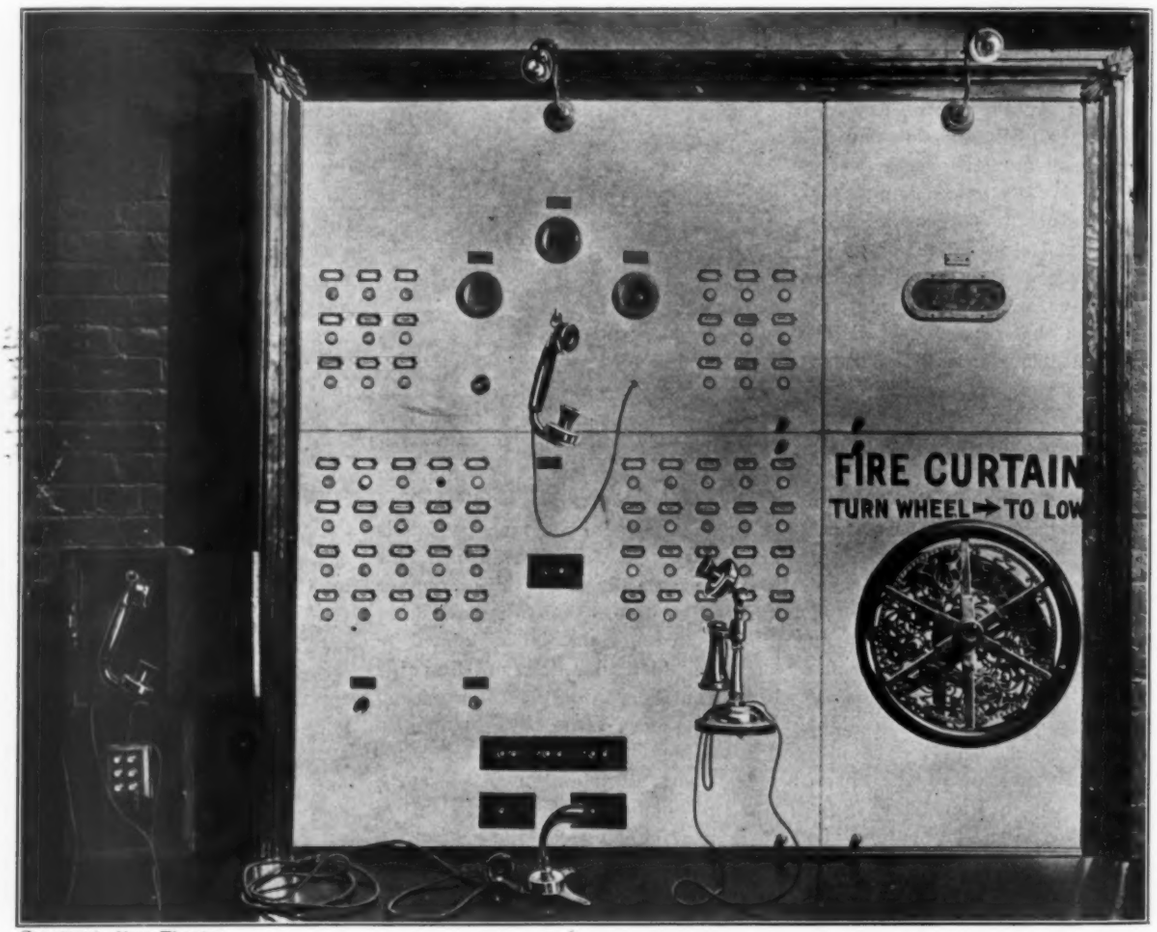
The new building of the C. A. Dorney Furniture Company, Allentown, Pa., has been scientifically laid out for electric illumination on the most modern lines to suit the particular requirements of the business. Several hundred large-sized Mazda lamps will be used.

# TELEPHONY—TELEGRAPHY, and WIRELESS.

## THE USES OF PRIVATE LINE TELEPHONES IN A MODERN THEATRE.

UP-TO-DATE INSTALLATION AT THE NEW THEATRE, NEW YORK, N. Y.

The New Theatre, which was opened early this season in New York city and has for its purpose the fostering of dramatic art, stands part from modern playhouses as representing the highest achievement in electrical art as applied to the stage. The lighting equipment is the latest development of the automatic operating type. The revolving stage, electrically operated, makes possible the setting of several scenes at one time. The stage managing and directing is systematized, and everything takes place about the stage exactly as it was planned with a smoothness that is comparable only to the precision of clockwork. Every operation in the production of a play is carefully worked out and executed by a definite plan, so that when the curtain rises everything is as it should be, minus the confusion which accompanies staging in most of our theatres.




Copyright, New Theatre.

FIG. 1.—TECHNICAL DIRECTOR'S BOARD.

In the execution of orders at and about the stage, and in the arrangements for the convenience of patrons, the telephone plays an important part. The photographs shown here illustrate the working of two separate telephone systems—the stage or technical director's system and the carriage-call system. Each of these systems is especially adapted for the particular service which it performs, and was designed, manufactured and installed by the Western Electric Company, the manufacturer of all the five million telephones used on the "Bell" telephone system.

The stage telephone system is an intercommunicating system, comprising

nine regular stations about the stage, twenty-five floor stations, and two master stations, these last being stations from which all the other stations may be reached by signals and brought into communication. One of these stations is known as the stage manager's board, and the other (Fig. 1), the technical director's board, this being the one most used in directing the operations on and about the stage. The nine regular stations comprise six stations located in the flies and stage galleries and the stations at the electrician's booth, prompter's booth and for the orchestra leader. The six stations located in the flies and galleries are intercommunicating, while the other three are used by the stage manager or technical director to give the cues signaled from these respective stations.

The six stations located in the flies and galleries are distributed at important points from the cellar to eleventh floor. Each is equipped as shown in Fig. 2 with a portable hand telephone set. This station is known as the working gallery, and communication can be obtained between it and the five other stations located as follows: shot chamber in the cellar, stage floor at controller for revolving stage, working gallery, first fly gallery, second fly gallery and rigging loft at the eleventh floor. These stations are signaled by means of buzzers operated by push buttons shown at the left of the telephone in Fig. 2.

Besides these nine regular stations, there are distributed throughout the stage, flies, and galleries, twenty-five flush telephone outlets in the floor known as the floor stations, each outlet being suitable for receiving a short telephone plug. Each of these stations is provided with a lamp signal two inches in diameter to indicate the incoming calls. The scene shifters and other stage operators are each provided with a head receiver and chest transmitter attached to a cord which terminates in a plug, which set is shown in Fig. 1. The signals for calling these stage hands are operated by means of push buttons from either the technical director's or stage manager's board. The system is so arranged that when either stage manager or technical director wishes to communicate with any of the stage operators he presses the proper button of the series shown at the right and left in Fig. 1. Those at the right operate the bull's-eye flash signal at the floor stations, while those at the left operate buzzers at the regular wall stations. The arrangement of the bull's-eye lamp signal in the flies and galleries is such that in case it is too noisy about the stage to attract the operator's attention at the regular station by the buzzer located there, the signal can be given him by means of the bull's-eye flash signal.

In conjunction with the telephone equipment arranged as mentioned, a system of call bells is provided to signal stage hands when not on the stage. The nine buttons on each side of the technical director's board at the top are used for this purpose and are connected to buzzers located at various rooms where stage help can be found in case of emergency or at other times when they are not on the stage and their services are desired.

The floor stations and flash signal are intended principally for the heads of those departments which have to do with the stage help and scene shifters. The heads of each department with whom it is necessary to communicate, wear a head receiver and chest transmitter all the time, so that whenever they notice their particular flash signal they know they are wanted and go to the nearest receptacle to learn what is desired. In case the particular head is not near the signal and does not see it, the information is transmitted to him through the station on the particular fly or side of the stage where he is supposed to be stationed.

Copyright, New Theatre.

FIG. 2.—TELEPHONE SET AT WORKING GALLERY.

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FIG. 4.—TELEPHONE SET FOR CARRIAGE-CALL SYSTEM.

During the performance of any scene, instructions can be given by this method without annoyance or any disturbance whatever. Also any instructions or additional orders can be given for any future changes to be made during the acting of any one scene.

This system is a great convenience to the stage manager and technical director in that it saves many steps and and makes it unnecessary to shout from one side of the theatre to the other.

Another feature of this telephone system is its use in trimming the ceilings, stage borders and hangers. The technical director does the final trimming for any scene from the first row in the orchestra, as shown in Fig. 3. It will be noticed that the telephone set used in this case is a portable hand set, the same as in Fig. 2, and is an extension to the corresponding telephone at the technical director's board. The set is connected to this board by means of a thirty-foot flexible cord, which is long enough to reach to the first row in the orchestra. By means of a portable set of buttons which the technical director holds in his hands he is able to signal the six important stations in the flies and galleries mentioned above. With communication between these stations he is able to make any changes which he finds necessary by viewing the setting from the body of the house.

The second telephone system mentioned is the one connected with the carriage-call system. As shown in Fig. 4, the attendant located at the window of the lobby is equipped with a head receiver and chest transmitter which is attached to a line terminating in a plug receptacle in the sidewalk on the outside of the building near the entrance. At this station another attendant is stationed at the end of the performance provided with a hand telephone set plugged into the receptacle, thus connecting him with the attendant in the lobby. As the patrons of the theatre come out of the house into the lobby they step to the window and announce the number of their carriage or automobile. This number is flashed on two electric signs, one at the top of the theatre at the front and the other on the side. When the driver recognizes his number and appears in the line so that the attendant on the sidewalk can see him, this attendant then transmits the number through his telephone to the attendant at the window, who in turn announces it to the patron. This system works out very satisfactorily, and is one which gives ready information to the patron who is waiting, without making it necessary for him to leave the lobby.

In addition to these private telephones the theatre has installed a standard Western Electric private branch exchange switchboard with approximately thirty-six house extensions to the various places about the stage, box office entrances and executive offices arranged with six trunk lines connected to the city exchange.

### Results Obtained by the Wireless Telegraph Station at Boulogne.

At a recent meeting of the Société Internationale des Electriciens Mr. Tosi made known some results obtained with the Bellini-Tosi system of wireless telegraphy, which has been installed in a station at Boulogne. He contradicted an idea which has become current, that the carrying distance of dirigible aerials is less than that of an ordinary antenna. The two dirigible aerials at Boulogne are supported by four pylons arranged over a square measuring eighty metres and each side; each aerial consists of a curtain of parallel wires reaching down to within eight metres of the ground; the height of the curtain is forty-six metres and each curtain forms an angle of thirty degrees with respect to the vertical plane.

Experiments made in January and February showed an excess of current in the dirigible aerial over that in the vertical antenna in the ratio of 240:175. Mr. Tosi attributes this result to the resistance of the earth, which does not play any part in the dirigible aerial, as it is insulated from the ground. The carrying distance of the dirigible aerial is more than double that of the vertical antenna, which is in conformity with theory.

The Boulogne station communicates with Folkestone, St. Marie-de-la-Mer and Algiers, the latter situated at a distance of 1,600 kilometres. In navigation the system permits the determination of the position of a station within about one degree.—*Translated and abstracted from L'Industrie Electrique (Paris), March 25.*

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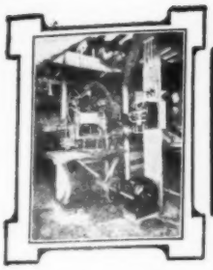
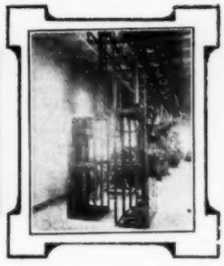
FIG. 3.—TELEPHONE FOR DIRECTING TRIMMING OF STAGE HANGINGS.

### A Pocket Wireless Receiver.

It is reported that Mgr. Cerebotani, Papal Nuncio at Munich, has invented a pocket wireless apparatus similar in size and shape to a large watch. The only accessories are a bobbin of wire and a metal-incased cone.



# Industrial Power



## ELECTRICITY ON THE FARM.[1]—I.

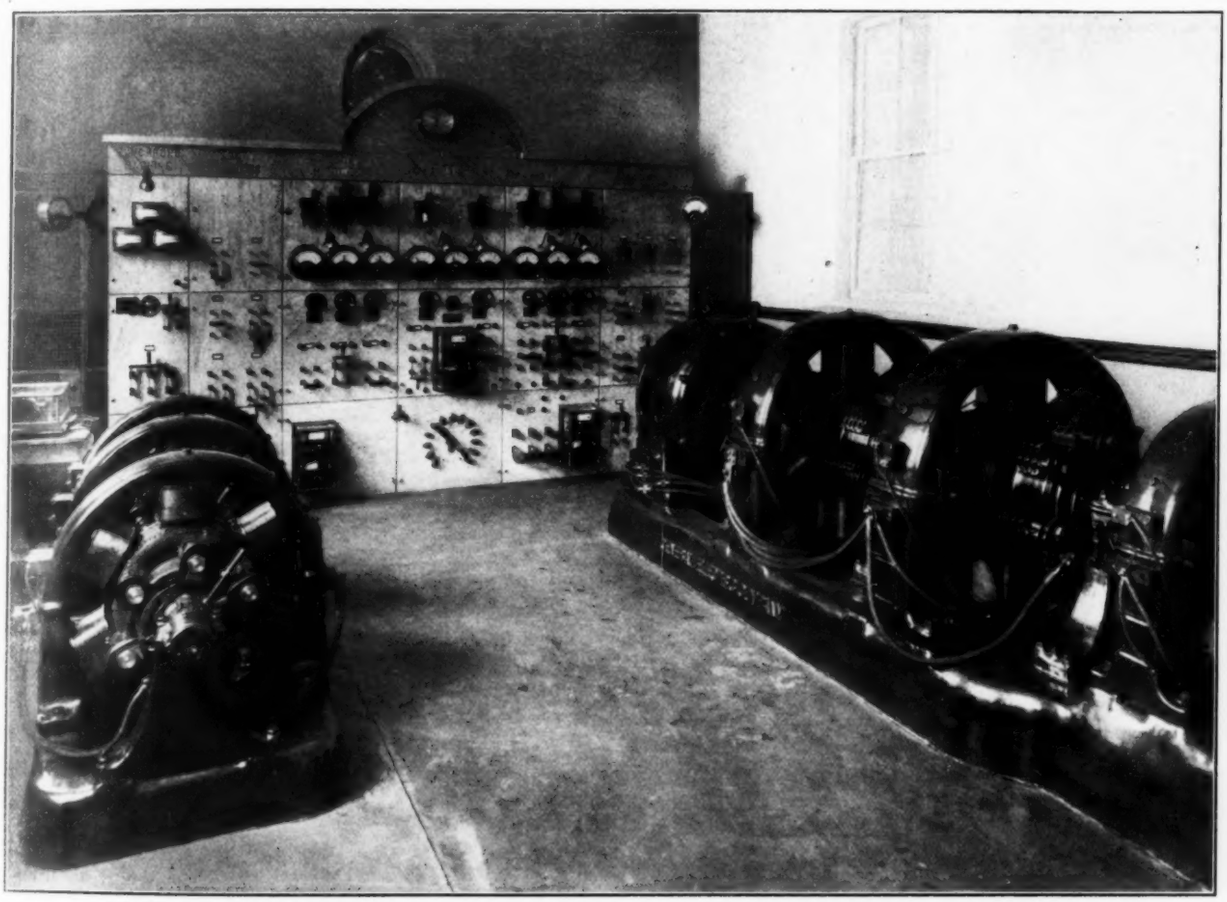
BY JOHN LISTON.

For the economical application of power to the various farm operations that are now to a very large extent carried on by mechanical means, electricity offers so many advantages for this particular service as compared with other sources of power that it stands pre-eminent. Its unqualified success on those farms where it has been adopted indicates that it has become a factor of such importance that it must now be seriously considered as affecting both the cost and quality of the products of the modern farm. If we compare electricity with other forms of applied power we find that its chief advantages are reliability, safety, cleanliness and flexibility in application.

Owing to the necessarily scattered location of the buildings on the average farm, the cost of power when applied by means of separate engines (except in isolated cases which can properly be considered as special) is practically prohibitive. At the same time, the use of such engines would add appreciably to the fire risk, which is a consideration of more vital importance in farming than in any other industry owing to the absolute dependence, as a rule, upon relatively limited local fire-fighting facilities. When electricity is used for power and lighting, the fire risk is reduced to a minimum.

In the application of electric power the relative location of the buildings is immaterial, as motors can be installed in each building or group of buildings and the current transmitted by means of wires from a central generating plant, which may be erected either on the farm or at a distance from it.

When planning the electrification of a farm, it should be remembered that as the service required of motors for farm work is in nearly every case intermittent, the periods for operating



MOTOR-GENERATOR SETS AND SWITCHBOARD AT FARM POWER STATION, MINER'S FARM, CHAZY, N. Y.

[1] Reprinted by permission (in slightly condensed form), from the *General Electric Review*.

the various units can be so arranged that at no time will all of the motors or even a large proportion of them be in operation simultaneously.

This condition will in most cases allow the installation to be so designed that a small generator can supply ample current for a relatively large number of motors, having an aggregate capacity greatly in excess of that of the generating plant. As a consequence the cost of generating current for a given capacity in motors for farm work is usually much lower than that involved in other industries.

The use of electric motors does not involve the necessity of employing skilled men to operate them, for, owing to the simplicity of the controlling devices, the average farm hand can start and stop them and control their speed without danger of injury to himself or the apparatus.

Local conditions must always affect the selection of a prime mover for the electric generators, and compact generating sets for utilizing steam, gas, gasoline or water power can now be readily procured. Where streams of sufficient head and volume exist in the vicinity of the farm, they may easily be converted into economical producers of electrical energy by the construction of dams and installation of automatically governed water turbines. Many streams have in recent years been utilized in this way with entire success, both as to cost and service rendered, even on comparatively small farms.

As an interesting demonstration of the value of electricity on the farm, the following description will appeal to every practical farm manager.

At Chazy, N. Y., near the western shore of Lake Champlain and at a point about fifteen miles north of the city of Plattsburg, there is located a modern stock and dairy farm which, in its operation, exemplifies the manifold advantages to be derived from the use of electricity for lighting and for the various power requirements of the farm.

This farm, which is owned by W. H. Miner and is called "Heart's Delight," is centrally located across the border line of Champlain and Chazy townships, in Clinton County, and covers an area of 5160 acres. The nucleus of the present farm consisted of the old Miner homestead of 150 acres, which is now entirely surrounded by the land subsequently acquired.

Of the total farm area, about 1,200 acres are under cultivation, another 1,200 acres are used for pasturage, and the remainder is woodland. The output consists of live stock and dairy products; all crops grown on farm being fed to the stock and only finished products shipped out.

The live stock includes registered Percheron and Belgian horses and pure bred Shorthorn Durham and Guernsey cattle, special attention being given to the raising of "Dorset" sheep for breeders and hot-house lambs and hogs for breeders and the production of sausage, hams and bacon. There is a considerable number of poultry and squabs, and a well equipped fish hatchery is devoted to the propagation of trout. The quality of the materials shipped is indicated by the fact that practically the entire output of the farm goes directly to the Waldorf-Astoria and to other high-grade hotels and clubs in New York, Washington and Chicago.

About three years ago it was decided to provide the farm with electricity for light and power, and the results have been so uniformly satisfactory that the equipment has been increased from time to time, some novel applications having resulted owing to the energy and initiative of those charged with the management of the farm.

Sufficient water power was found on the farm itself to provide a cheap and reliable source of electric energy. Two streams pass through the southern portion of the farm, the smaller one being known as Tracy Brook and the larger one as the Chazy River. It was found that these streams were both fed by numerous active springs which, together with the drainage area afforded by the Adirondack foot hills, insured a dependable flow of water that could readily be conserved by the construction of dams.

Across Tracy Brook three small concrete dams were built, thereby forming three ponds and giving a total reservoir area of about 170 acres. A concrete penstock forty-four inches inside diameter and 670 feet long carries the water from the reservoir to a power house compactly constructed of concrete, and so located as to obtain an effective head nineteen feet.

The power house equipment consists of two reaction water turbines, automatically governed and direct-connected respectively to one thirty-kilowatt and one twelve and one-half-kilowatt, 220-volt, direct-current generator. The current is transmitted over a pole line one and one-quarter miles long to a central station located in the main group of farm buildings.

TRACY BROOK POWER STATION, MINER'S FARM, CHAZY, N. Y.

About a mile below the power house Tracy Brook joins the Chazy River, and the tail-race water from the Tracy Brook station adds to the volume of water in the Chazy River reservoir, which is formed by a dam across the river a short distance below the point of confluence of the two streams.

The Chazy River is about thirty miles long and empties into Lake Champlain; it has a considerably greater volume than Tracy Brook, and it was found that by building dams ample storage water and an effective head of thirty feet could be obtained. It was there-

fore decided to construct two concrete dams and a second and larger power house to supplement the Tracy Brook station, to provide current for the rapidity extending electric power applications at the farm.

After passing through screens at the intake gate-house (which forms part of the lower dam), the water is carried to the Little Chazy power house through a concrete penstock forty-eight by sixty inches inside diameter and 630 feet length. At the power house it enters a concrete flume provided with controlling gates and is led directly to the water turbine wheels by short steel pipes.

There are two turbine belts connected respectively to one fifty-kilowatt and one 100-kilowatt, 2,300-volt, sixty-cycle, three-phase General Electric alternating-current generators. The current is transmitted at the generator voltage over a single circuit pole line two and three-fourths miles long, to the power station at the farm.

In the hydroelectric development the work has been carefully and thoroughly done, so that the danger of interrupted service has been reduced to a minimum. The concrete penstocks are reinforced with steel bars, both horizontally and vertically, and are covered with earth embankments. The tail water from the Chazy River power house is carried by a canal to some distance below the station before being returned to the river, in order to secure the full benefit of the available head. The turbine governors are arranged for both hand and automatic control, and in addition, the governors at this station are also provided with emergency motor-operated mechanisms, controlled from the switchboard. Telephone wires are carried on the transmission pole lines, establishing communication between the power houses and the central station on the farm.

The transmission line poles are of cedar with fir cross-arms, and are fitted with pin insulators; they are from thirty-five to forty feet high and are spaced at an average of about 120 feet. The conductors are bare copper wire, No. 00 B. & S. being used for the Tracy Brook line and No. 2 B. & S. for the Chazy River line.

An auxiliary of the hydraulic equipment consists of two hydraulic rams receiving head from the Tracy Brook reservoir and pumping water to a 60,000 gallon tank located 100 feet above the ground on a steel tower erected at the farm for fire protection.

As stated above, both the direct-current Tracy Brook power house and the alternating-current Chazy river power house feed into a power station at the farm, where the equipment includes a six-panel switchboard and two motor-generator sets of General Electric manufacture, and a storage battery.

Nearly all the motors used on the farm at present are direct-current machines, operating on 110 and 220-volt circuits, and in order to supply the 110-volt motors and the lighting circuits, and to charge the storage battery, the current which is received from the Tracy Brook power house at 220 volts direct current is stepped down by means of a three-unit, 1,100 revolutions-per-minute direct-current motor-generator set, consisting of one twenty-five-kilowatt, 220-volt, direct-current motor, compound-wound; one twenty-five-kilowatt, 110-volt, direct-current generator, compound-wound; one twelve-kilowatt, 110 to 150-volt, direct-current generator, shunt-wound.

The alternating current from the Chazy River power house is received at 2,300 volts, three-phase, sixty cycles, and stepped down to 220 volts through three forty-kilowatt type H transformers. It is then converted to direct current by means of a four-unit, 900 revolutions-per-minute, motor-generator set, consisting of one 100-horsepower synchronous motor; one seventy-five-kilowatt, 220-volt, direct-current generator, compound-wound; one seventy-five-kilowatt, 110-volt, direct-current generator, compound-wound; one twelve-kilowatt, 110 to 150-volt generator, shunt-wound.

These two sets are interconnected by means of switches in order to insure continuity of service in the event of a shutdown of either of the hydroelectric stations. If the incoming direct-current supply is interrupted, the alternating-current—direct-current motor-generator set can replace it. Vice versa, if the incoming alternating current supply fails, the 220-volt direct-current unit of the alternating-current—direct-current set is operated as a motor, and the synchronous motor is then utilized as an alternating-current generator.

On both of the motor-generator sets the twelve-kilowatt units are used for charging the storage battery, which consists of fifty-two main and thirteen end cells, and has a capacity of 600 ampere-hours. The battery is used as a balancer, and for lighting and power after 9.30 p. m., at which time the hydroelectric plants are shut down.

An interesting feature of the farm power station is an electrically operated instrument which is connected with a weather station located on one of the fire tank towers and automatically records on a cylindrical chart a continuous record of the speed and direction of the wind, the amount of moisture in the air, and the precipitation.

The steam-boiler capacity at the farm station is 120 horsepower. Steam is used in the various farm buildings for heating, for cooking food for the animals, and for the operation of air and circulation pumps. There is also a vertical engine direct-connected to a 22.5-kilowatt, 110 to 150-volt, direct-current generator, this set being ordinarily held as a reserve.

It will be seen from the foregoing that, in planning the farm equipment, every effort has been made to insure the continued maintenance of the electric service. That the precautions are fully justified by the benefits derived from the electric service, in the saving of time and labor, and the possibility of carrying on all indoor work under safe, well lighted and sanitary conditions, will be fully appreciated from the following description of the varied motor applications.

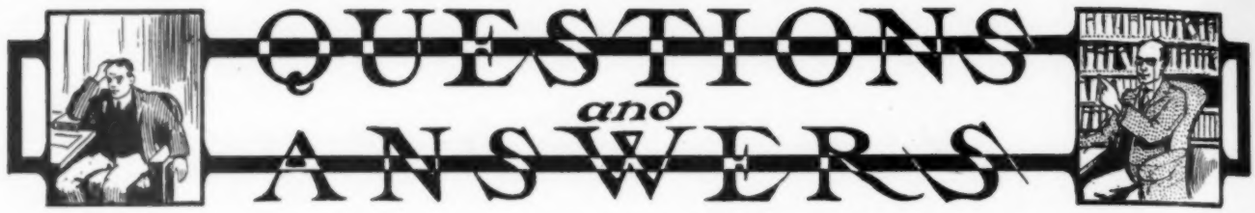
*(To be continued.)*

### Electricity Aids Building in Denver.

The new Chamber of Commerce building in Denver, Col., is being built largely with the aid of electric power. Among the equipment being used is a six-horsepower direct-current motor for hoisting the steelwork, a fifteen-horsepower motor-driven concrete mixer, and a directly driven motor-operated brick hoist of three horsepower. Besides all this there is an electric-lighting installation being used in the dark basement instead of the customary gasoline flares.

The doubling of the capacity of its mills and the employment of electric power in operation at its mines at Johnnie, Nev., are contemplated by the Johnnie Mining and Milling Company.

The company is considering the establishment of an electric power plant, and also a proposal of the Bishop Power Company to furnish electric power.




SELECTIVE RINGING ON PARTY LINES.—Is it possible to arrange the calling on party lines so that, instead of having all the bells ring and the subscriber having a particular number of rings to which he answers, the bell of the called subscriber only will ring? How may this be done, if it can be done at all?—F. J. Z., Austin, Texas.

Selective ringing is possible on party lines having limited numbers of subscribers. By means of it the bell of the subscriber desired only is rung. This is done in one of two ways depending on whether the line is a plain two-wire circuit or has an auxiliary ground wire. In this the various bells on the circuit are so adjusted or "tuned" that each one will ring only when a current of particular frequency is applied. All the bells are bridged across the circuit and all receive the ringing currents, but respond to their own frequency only. In signaling a particular party, a ringing current of the particular frequency adapted to his bell is sent out on the line. Selective ringing can also be carried out by what are called "biased" bells. These respond to current in one direction only. Thus, in a two-party line, by sending out current in one direction one of the two bells only is rung; by sending the ringing current in the reverse direction the other bell only is rung. This idea is extended to four-party lines by connecting two such biased bells between one side of line and ground and the other two bells between the other side of line and ground. The ringing key is arranged so it can connect either side of line to either side of the source of ringing current, thus making it possible to ring any one of the four bells independently. Selective ringing does away with the annoyance of ringing all the bells on the circuit every time any one of the subscribers on it is wanted.

BENCHBOARDS.—What is a benchboard in connection with an electric power plant?—W. S., Kansas City, Mo.

A benchboard is a form of switchboard having its panels horizontal or almost horizontal, thus forming a sort of operating bench. Some of the earliest switchboards were arranged that way, but this construction was later abandoned. It has been revised to some extent for remote-control switchboards and for these the bench portion of the board contains the control switches and usually red and green pilot lamps to indicate whether each switch is closed or open. Indicating instruments, such as voltmeter, ammeters, frequency and power-factor indicators and synchroscopes, are usually mounted on vertical panels above and back of the bench panels. In no case are the actual busbars and generator or feeder leads now brought to the benchboards and all the wiring reaching it is for low-potential control or instrument circuits.

REVERSING A THREE-PHASE INDUCTION MOTOR.—A few days ago I connected up a three-phase motor exactly as directed and found it did not run in the direction I expected, so I put a reversing belt on it. I was told I might have changed the wiring. How could this be done?—M. B., Seattle, Wash.

A simple interchange of any two of the three wires leading to the motor would have reversed its direction of rotation. In fact, a reversing switch can be installed to interchange two of these wires at will, thus having a ready means of reversing the motor regularly. A main triple-pole switch must be provided, however, and always opened before the two wires leading to one phase are reversed.

VALUE OF CREOSOTING TIES.—Does the creosoting of ties increase their life sufficiently to pay for its cost? Is there any cheaper process of wood preservation that could be used for electric railway ties?—R. M. W., Austin, Texas.

The cost of creosoted railway ties compared with untreated ties and the increased life obtained as the result of such treatment depend somewhat on local conditions and the kind of timber used. For oak ties the increased cost may be from fifty to eighty per cent, depending on the quality of the wood and the degree of saturation specified for the creosoting, as well as the relative importance of the freight charges and other factors. The increased life obtainable from creosoted oak ties is from three to nearly ten times that of untreated ties, depending on the character of the soil, the ballast, the climate, the traffic, etc. This shows the value of this preservative treatment. A process of preservation by impregnation with zinc chloride is a very good one and cheaper than creosoting, but it is not adapted for railway ties because zinc chloride is somewhat soluble and rains would therefore dissolve or leach it out. Another feature that will materially increase the life of ties is the use of screw spikes.

DUPLEX AND DIPLEX TELEGRAPHY.—What is the difference between duplex and diplex in telegraphy?—T. N. R., Wheeling, W. Va.

Duplex in telegraphy refers to a system in which two messages can be sent over the same wire in opposite directions at the same time. Diplex refers to a system wherein two messages can be sent in the same direction at the same time. Quadruplex systems are both duplex and diplex at the same time, but a duplex-diplex system has been devised by Professor Crehore which enables the sending of duplex or of diplex messages at the same time, but not both kinds together, as in quadruplex telegraphy.

### St. Louis Merchants Extend Street Lighting Scheme.

Merchants on Easton avenue, St. Louis, Mo., from Leffingwell avenue to the city limits, have recently made arrangements for lighting the street. Each block will be a separate district under the supervision of the merchants' association, and will send one representative to the association meetings. The lights will be similar to those installed on Broadway last year, and will be put in at once.

The 3,500 block has already begun work. Other blocks which are ready to put in the lights are 3,100, 4,100, 4,600 and 4,900 blocks. The 4,500 block put in lights last year. After the street is lighted other street improvements will be made.

# FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

## METROPOLITAN STREET RAILWAY.

The New York Public Service Commission has issued a report covering the lines comprising the Metropolitan Street Railway for the quarter ended December 31, 1909, compared as follows:

| | 1909 | 1908 |
|---|---|---|
| Total operating revenue | $3,802,649 | $3,608,097 |
| Operating expenses and taxes | 2,963,656 | 3,073,675 |
| Operating income | $ 838,993 | $ 534,422 |
| Other income | 40,944 | 33,507 |
| Total income | $ 879,936 | $ 567,929 |
| Interest, rent, etc. | 683,916 | 799,743 |
| Net corporate surplus | $ 196,020 | *$ 231,814 |

*Deficit.

## PACIFIC GAS AND ELECTRIC.

The Pacific Gas and Electric Company has issued its report for the year ended December 31, 1909, which compares as follows:

| | 1909 | 1908 |
|---|---|---|
| Gross revenue | $13,332,501 | $12,853,817 |
| Oper. exp., taxes, reserves, interest, etc. | 10,280,098 | 10,801,487 |
| Net revenue | $ 3,052,402 | $ 2,052,330 |
| Debenture interest | 240,000 | 240,000 |
| Balance | $ 2,812,403 | $ 1,812,330 |
| Deductions: | | |
| Accrued dividends on preferred stock | 600,000 | *..... |
| Sinking funds | 667,209 | *..... |
| Bond discount, etc. | 42,237 | *..... |
| Total deductions | 1,309,446 | *..... |
| Surplus | $ 1,502,957 | ..... |

*Deductions not available for 1908.

## MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company for the month of March and six months ended March 31, compares as follows:

| | 1910 | 1909 |
|---|---|---|
| March gross | $ 336,196 | $ 298,728 |
| Expenses | 220,790 | 203,832 |
| March net | $ 115,406 | $ 94,896 |
| Charges and taxes | 43,068 | 38,901 |
| March surplus | $ 72,338 | $ 55,995 |
| Six months' gross | 1,992,236 | 1,813,342 |
| Expenses | 1,216,984 | 1,149,584 |
| Six months' net | $ 775,252 | $ 663,759 |
| Charges and taxes | 214,978 | 198,043 |
| Six months' surplus | $ 560,273 | $ 465,716 |

## AMERICAN LIGHT AND TRACTION COMPANY.

The American Light and Traction Company has issued a statement of earnings covering the twelve months ended March 31, 1910, which compares as follows:

| | 1910 | 1909 |
|---|---|---|
| †Earnings | $3,117,161 | $2,627,959 |
| Miscellaneous earnings | 346,419 | 284,043 |
| Gross earnings | 3,463,580 | 2,912,002 |
| Expenses | 107,445 | 59,023 |
| *Net earnings | $3,356,135 | $2,852,979 |
| Surplus and reserve previous year | 6,131,563 | 4,686,467 |
| Total surplus | $9,487,698 | $7,539,446 |
| Dividends | *3,243,884 | 1,407,883 |
| Surplus March 31 | $6,243,814 | $6,131,563 |

†Earnings on stock of subsidiary companies owned.
*Includes $1,530,917 stock dividend on common.

## NIAGARA, LOCKPORT AND ONTARIO.

The Niagara, Lockport and Ontario Power Company reports earnings for the month of March compared as follows:

| | 1910 | 1909 |
|---|---|---|
| Gross earnings | $38,956 | $27,658 |
| Expenses | 16,936 | 15,695 |
| Net | $22,020 | $11,963 |
| Other income | 1,143 | 5,418 |
| Total income | $23,163 | $17,381 |
| Interest | 20,833 | 20,833 |
| Surplus | $ 2,330 | *$3,451 |

*Deficit.

## MASSACHUSETTS ELECTRIC COMPANY.

The Massachusetts Electric Company's statement for the quarter and six months ended March 31, 1910, compares as follows:

| Jan. 1-Mar. 31 | 1910 | 1909 |
|---|---|---|
| Gross | $1,767,153 | $1,613,034 |
| Expenses | 1,256,599 | 1,238,264 |
| Net | $ 510,554 | $ 374,770 |
| Charges and taxes | 470,532 | 450,698 |
| Surplus | $ 40,022 | *$ 75,928 |
| Oct. 1-Mar. 31: | | |
| Gross | $3,688,227 | $3,385,789 |
| Expenses | 2,585,500 | 2,535,692 |
| Net | $1,102,727 | $ 850,097 |
| Charges and taxes | 915,187 | 887,592 |
| Surplus | $ 187,540 | *$ 37,495 |

*Deficit.

## LAKE SHORE ELECTRIC.

The Lake Shore Electric Railway Company reports for March and three months ended March 31, 1910, compare as follows:

| | 1910 | 1909 |
|---|---|---|
| Gross earnings | $ 85,983 | $ 76,679 |
| Net | 36,842 | 29,443 |
| Surplus | $ 2,038 | *$ 4,881 |
| Jan. 1 to March 31: | | |
| Gross earnings | $235,854 | $210,741 |
| Net | 90,897 | 73,912 |
| Deficit | $ 13,022 | $ 29,324 |

*Deficit.

## AMERICAN CITIES RAILWAY AND LIGHT.

The American Cities Railway and Light Company reports combined earnings of the operating companies for the month of March and three months ended March 31, 1910, compared as follows:

| | 1910 | 1909 |
|---|---|---|
| Gross earnings | $ 516,699 | $ 452,596 |
| Operating expenses and taxes | 299,779 | 264,371 |
| Net earnings | $ 216,919 | $ 188,224 |
| Interest and sinking fund | 110,937 | 106,351 |
| Surplus | $ 105,982 | $ 81,873 |
| Reserve funds, emergency and betterments | 7,000 | 15,223 |
| Net surplus | $ 98,982 | $ 66,649 |
| Jan 1-March 31: | | |
| Gross earnings | $1,506,998 | $1,347,584 |
| Operating expenses and taxes | 873,709 | 784,569 |
| Net earnings | $ 633,289 | $ 563,014 |
| Interest and sinking fund | 331,786 | 318,864 |
| Surplus | $ 301,502 | $ 244,149 |
| Reserve funds, emergency and betterments | 34,791 | 49,240 |
| Net surplus | $ 266,711 | $ 194,908 |

## NEW YORK AND QUEENS ELECTRIC LIGHT AND POWER.

The New York and Queens Electric Light and Power Company reports earnings to the New York Stock Exchange for the year ended December 31, 1909, as follows:

| | |
|---|---|
| Gross | $585,996 |
| Operating expenses | 268,909 |
| Net earnings | $317,086 |
| Interest and amortization | 219,140 |
| Surplus | $ 97,945 |

Earnings for the two months ended February 28, 1910, show as follows:

| | |
|---|---|
| Gross | $117,402 |
| Operating expenses | 51,564 |
| Net earnings | $ 65,838 |
| Interest and amortization | 38,669 |
| Surplus | $ 27,168 |

## THIRD AVENUE RAILROAD.

The New York Public Service Commission has issued a report covering the lines comprising the Third Avenue Railroad system for the quarter ended December 31, 1909, compared as follows:

| | 1909 | 1908 |
|---|---|---|
| Total operating revenue | $1,908,884 | $1,792,207 |
| Operating expenses and taxes | 1,290,417 | 1,187,649 |
| Operating income | $ 618,467 | $ 604,558 |
| Other income | 11,387 | 8,671 |
| Total income | $ 629,854 | $ 613,229 |
| Interest, rentals, hire of equipment, etc. | 206,991 | 217,436 |
| Net corporate surplus | $ 422,863 | $ 395,793 |

## NORTHERN OHIO TRACTION.

The report of the Northern Ohio Traction and Light Company for the month of March and three months ended March 31 compares as follows:

| | 1910 | 1909 |
|---|---|---|
| March gross | $173,424 | $150,684 |
| Expenses | 99,159 | 86,720 |
| March net | $ 74,265 | $ 63,964 |
| Charges | 43,291 | 43,803 |
| March surplus | $ 30,974 | $ 20,161 |
| Three months' gross | 484,575 | 435,084 |
| Expenses | 286,173 | 251,972 |
| Three months' net | $198,402 | $183,112 |
| Charges | 129,874 | 131,485 |
| Three months' surplus | $ 68,528 | $ 51,627 |

## ONTARIO POWER COMPANY OF NIAGARA.

The report of the Ontario Power Company of Niagara Falls, for the month of March, compares as follows:

| | 1910 | 1909 |
|---|---|---|
| Gross | $53,350 | $39,057 |
| Expenses | 10,946 | 9,148 |
| Net | $42,405 | $29,908 |
| Other income | 4,723 | 298 |
| Total income | $47,128 | $30,206 |
| Interest | 42,833 | 26,276 |
| Surplus | $ 4,295 | $ 3,930 |

## KANSAS CITY HOME TELEPHONE.

The Kansas City Home Telephone Company and the Kansas City Long-Distance Telephone Company have issued a combined report for the year ended March 31, 1910, which compares as follows:

| | 1910 | 1909 |
|---|---|---|
| Gross earnings | $1,246,026 | $1,100,081 |
| Expenses | 667,849 | 590,209 |
| Net earnings | $ 578,177 | $ 509,872 |
| Interest | 213,501 | 204,537 |
| Surplus | *$364,676 | $ 305,335 |

*Equal to 12.15 per cent earned on $3,000,000 capital stock outstanding.

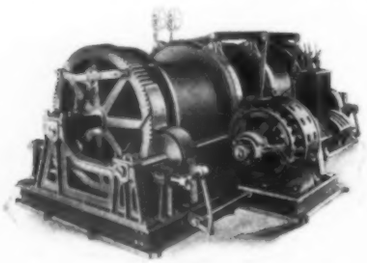
# INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

### Electric Motor-Driven Mine Hoists.

The single and double drum electric motor-driven mine hoists of the S. Flory Manufacturing Company, Bangor, Pa., which are shown by the accompanying illustrations, are especially designed for mines, quarries, planes, shafts, etc. Both of these hoists are equipped with the I. O. Werner patent band friction and are driven by Westinghouse motors.

The patent band friction is of special design and possesses many features of



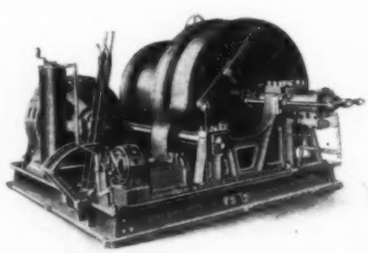
DOUBLE-DRUM ELECTRIC HOIST.

superior merit. It is actuated through different members; the gear, drum, rocker shafts and strap bands. The strap bands tighten on a cast rim on the drums and are actuated by shafts which have double stub ends and are connected to the ends by jaw ends and turnbuckles. The lever arms are keyed to the rocker shafts on opposite ends and are actuated by the levers which move around fixed points on the gear. Slides are secured on the gear supporting the lever arms. The slides are actuated through a sleeve on the main drum shaft and two radial arms which are secured to the slides. The frictions are thrown in and out of contact by means of hand levers in a battery, as shown by the cut of the double drum hoist, or by an air cylinder using an equipment similar to street railway car air compressors, as shown by the picture of the single drum hoist. By moving the sleeve to the gear the slides are actuated in a radial direction that operates the stub levers and rocker shaft; this causes the band to grip or tighten on the brake flanges of the drums. The reverse motion of the sleeve releases the friction.

The single-drum hoist is shown with a Westinghouse electric railway compressor and air reservoir mounted on the base of the hoist. The reservoir is connected to the air cylinder at the end of the drum shaft. The air valves are actuated by a lever shown close to the battery of two levers and controller. Very little exertion is required by the motorman to throw the friction in and out of contact as it is of the toggle type. After the air compressor is put on, the contact continues until the friction is reversed by the reverse motion.

The drums are turned off smooth or machine spirally grooved for any size wire rope, and mounted on a self-contained cast iron base arranged to receive the motor and controller. The drums for long planes or heavy lowering are equipped with asbestos brakes made out of long fibre material.

The single-drum hoist shown by the photograph was installed at the Bliss Colliery of the Delaware, Lackawanna & Western Company. The drum is sixty inches in diameter; forty-eight inches long between the flanges, and is designed for an 8,000-pound rope strain at a speed of 500 feet per minute. The hoist is operated by a Westinghouse type "HF" 150 horsepower alternating current motor.



SINGLE-DRUM ELECTRIC HOIST.

The double-drum hoist shown was installed for the Bessemer Coal, Iron and Land Company, Messins, Ala. It is connected to a Westinghouse 125 horsepower motor of the same type as is shown with the single-drum hoist.

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Radium, according to quotations by the Austrian Government, which sells only to scientific men and institutions, has now come down in price to the relatively modest figure of $36,500,000 a pound.

### Trumbull One-Piece Molding Receptacle.

To meet a demand which has existed for a long time, the Trumbull Electric Manufacturing Company, Plainville, Conn., has just placed on the market a new one-piece molding receptacle, shown in the accompanying illustration.

This one-piece receptacle can easily be placed on top of the molding at the time when the wires are run, or afterwards as convenient. No cutting of wires nor soldering of tapes is necessary.

ONE-PIECE MOLDING RECEPTACLE.

The wires can be looped through the receptacle and skinned to fit in under set screws. These receptacles are manufactured to fit the Paiste pipe taplet, No. 4110.

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### Preparing for St. Louis Convention.

The unusual interest which is being taken in the coming National Electric Light Association Convention at St. Louis, May 23 to 28, in indicated by the elaborate preparations which Stone & Webster are making for their service organizations. This syndicate has engaged forty-five rooms at the Hotel Jefferson, for Convention week and will hold its company convention either before or after the National Association sessions.

The New England delegation of Stone & Webster has engaged a special car which will go from Boston to St. Louis in charge of William H. Blood, Jr.

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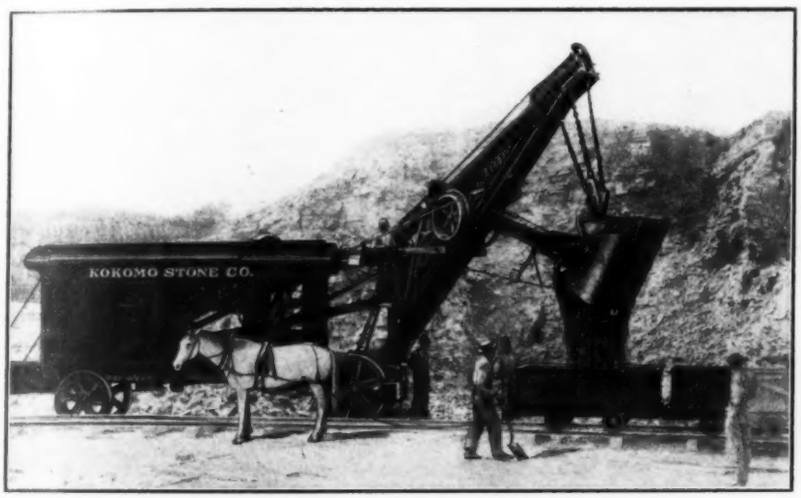
### An Electric Sewage Pump.

The city of Durban, Natal, S. A., has recently decided to instal an electrically driven pump to handle sewage matter.

### The Electric Shovel in Contracting.

Where electric power is available, an electric shovel offers many advantages over a steam shovel. Chief among these is the elimination of the boiler, the most annoying part of a steam-shovel outfit. Very often the shovel works in territories where good water is not available, and as a result of the inferior feed water, the boiler frequently requires repairs. Of course these repairs involve a loss of time and money. Besides, there are the expenses of a fireman, of piping or hauling water, and of hauling fuel, that go to make up a considerable outlay of money in the course of a year. Again, a steam shovel wastes considerable fuel and water at night, especially in winter, as the fire must be kept up to prevent the boiler and pipes from freezing. Furthermore, an important saving arises from the fact that an electrical shovel uses power only when it is doing actual work. When steam power is used for a shovel, the steam must be kept up all the time, whether the shovel it at work or idle, thereby involving a considerable waste of fuel and water. On an electric shovel, the power is always ready, easily applied, and is not being consumed when the shovel is idle waiting for cars or from any other cause. As soon as the power is cut off from the motors, the consumption of current stops; hence there is no waste of current whatever.




"LITTLE GIANT" ELECTRIC SHOVEL IN USE.

The electric shovel should appeal strongly to brick and tile manufacturers, to owners of stone and quarries, cement plants, electric railroads, placer gold mines, and ore mines that are being operated by what is known as the "open-cut" method, as a battery of electric shovels operated from a central power plant will affect an enormous saving over steam shovels.

The shovel shown by the photograph is of the "Little Giant" type, mounted on cast-steel traction wheels. It carries a dipper having a capacity of one and a quarter cubic yards, and weighs approximately thirty-five tons. It will make a cut forty feet wide in a ten-foot bank and will clear a floor of twenty-six feet. The point of the crane stands twenty feet above the ground. The dipper will dump twelve feet six inches above the ground and twenty-one feet out either way from the center of the shovel. The car body is twenty-three feet long by seven feet wide.

The shovel is equipped with three Westinghouse motors, as follows: one sixty-horsepower motor for hoisting the dipper, one thirty-horsepower motor for swinging the crane, and a thirty-horsepower motor on the crane for crowding the dipper into the bank. All the motors are for sixty-cycle, two-phase, 220-volt alternating current. The shovel has a capacity of from 600 to 800 cubic yards of the blasted rock shown in the illustration per ten-hour day. It was installed for the Kokomo Stone Company, by the Vulcan Shovel Company, Toledo, Ohio.

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The Allis-Chalmers Company reports that its gas engine business continues to increase and at present the full capacity of the gas engine shop is required for gas engines alone.

## TELEPHONE TRAIN DISPATCHING.

NORFOLK AND SOUTHERN RAILWAY INSTALLATION.

The Norfolk and Southern Railway is about to install a telephone train dispatching system on its main line from Norfolk to Washington. The equipment has already been ordered and it is expected that the apparatus will be placed in service some time early this summer.

The telephone line over which dispatching will be done on this system consists of two heavy copper wires, each weighing 210 pounds to the mile, so that a grade of transmission of speech will be obtained equal to any furnished on the commercial telephone lines throughout the country. It is a very essential feature of a train dispatching circuit that the grade of speech obtained over it be first-class and clear in every particular, and it is with this aim in view that the Norfolk and Southern has taken great care to see that its circuit conforms to these conditions.

The equipment to be installed is what is known as the Western-Electric—Gill system and consists of Western Electric telephone apparatus with Gill selectors. Twenty stations along the 136 miles of line will be equipped so that the dispatcher can call them individually or collectively.

In addition to the above equipment which will be used in the regular work of handling train movements, the Norfolk and Southern will install about eight siding telephone sets at various points along the line. Two will be located at the Mackey's Ferry drawbridge in cable booths at that point, while the remainder are of a design which is arranged to be mounted on the telephone poles along the right of way. These sets are contained in a heavy iron weatherproof case and are placed at important sidings along the line. The train crew can go to one of these telephone sets and talk to the dispatcher directly. This set to be installed on the Norfolk and Southern is the very latest type put out by the Western Electric Company and is designed especially to meet the railroad conditions.

In addition to the foregoing, one of the most important innovations of all is the use of portable telephone sets on the trains. This is one of the most prominent advantages of a telephone train dispatching system on a railroad. It

gives the road the opportunity of placing on all its trains portable telephone sets which can be connected to the telephone line by means of a jointed fish pole. In cases of emergency where it is of the utmost importance that the conductor get into immediate touch with the officials of the railroad and give them details as to the trouble in order that they may know what assistance is required, the portable set has shown itself to be invaluable.

VIRGINIAN RAILWAY INSTALLATION.

The Virginian Railway has recently placed an order for a complete train dispatching equipment to extend over its first and second divisions. When this is installed the entire railroad will be equipped with telephone apparatus for handling train movements.

On the third division of this railroad extending from Roanoke to Deepwater the telephone is being installed at the present time.

This system on the third division employs Western Electric telephone apparatus with Gill selectors. The equipment to be installed on the first and second divisions is of the same type, but will make use of the latest type of central energy selector. By means of this new piece of apparatus the bells at all the way stations are rung from battery supplied from the dispatcher's office over the telephone line. This represents the latest development in telephone train dispatching. The installation is being done under the supervision of G. N. MacDougald, the signal engineer of this road.

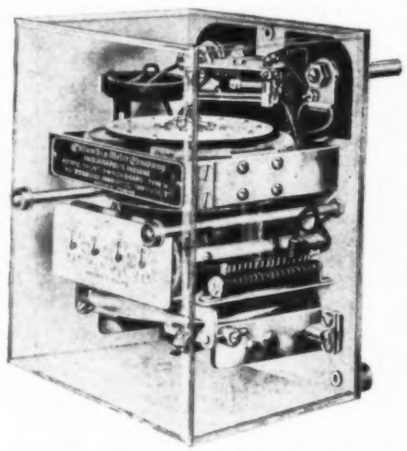
The two divisions for which equipment has recently been ordered from the Western Electric Company extends from Norfolk to Roanoke, with the dispatcher located at Victoria in the center of the line. It is approximately 250 miles in length and the telephone circuit over this stretch will be built up of heavy copper wire weighing 210 pounds to the mile. Along this line there will be located thirty-one stations equipped with Gill selectors and twenty-seven stations equipped with telephones but without selectors. These latter are so that the train crews can get into direct communication with the dispatcher whenever they so desire and the selector equipment is unnecessary because these sets are located in booths and unimportant stations along the line where there are no station agents.

## Columbia Astatic Shunted Switchboard Type Integrating Wattmeters.

The Columbia Meter Company of Indianapolis, Ind., has developed an integrating wattmeter of the astatic shunted switchboard type. In perfecting this type of meter the company has aimed at accuracy, sensitiveness on light loads, and adaptability of design for switchboard work.

The design of this new switchboard type of meter follows the design in general of the company's type "D" meter, which has proven its excellence in the four years that it has been in operation in stations all over this country and abroad.

Large switchboard meters are subject to stray fields due to the heavy busbars and currents around switchboards and a meter to be accurate in



COLUMBIA ASTATIC INTEGRATING WATTMETER.

switchboard service must be astatic. In the present meter the armature consists of six small parallel coils placed equidistantly around the shaft with a separate magnetic core for each coil, each core extending radially outward from both ends of the coil, and each of the radially extending ends of the cores being divided into a plurality of paths. Thus the effect of induction and stray fields is nullified. A six-part silver commutator is used in connection with the coils. The armature construction is somewhat heavier than that in the standard house-type meter, and therefore the company has adopted diamond jewels which insure the longest life and least amount of friction. The design permits of the use of the meter on switchboards in close proximity to large generators and busbars carrying heavy currents without in any appreciable way affecting its accuracy.

Instead of passing all the current through the series coils, shunts may be used, and this should appeal to switchboard builders and users of large meters, as it does away with expensive and cumbersome connections of heavy terminals direct to the meter. All of these astatic meters are of ten-ampere capacity and are connected to shunts of suitable size in capacity with ten-ampere leads. The shunts may be placed behind the switchboard or at any convenient point where they can be connected in series with the main lines.

The shunts are standardized to size for their capacity, have a drop of about 100 millivolts, and are well ventilated and designed so as not to become heated. The meters are furnished in both type "H" and type "F." Type "H," an illustration of which is shown herewith, is the standard astatic switchboard type and is furnished complete, back-connected with five-foot shunt leads and shunt. The cover is a fine beveled plate glass and all the parts are highly finished and lacquered.

Type "F" is the standard astatic house-type meter and is furnished front-connected with the company's standard pressed aluminum cover with glass front. The shunts are furnished with suitable metal covers that can be sealed so as to prevent tampering.

## Westinghouse Companies Get Irrigation Order.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., has recently entered an order for two 600-kilowatt alternating-current generators, to be installed in connection with the work of the Portales Irrigation Company, Portales, N. M. The Westinghouse Machine Company will make the gas engines to drive these and will also furnish three 500-horsepower bituminous gas producers. The generators will develop a three-phase, sixty-cycle, 2,300-volt current which will be stepped up to 11,000 volts. At the substations, this will be reduced to 440 volts.

In connection with this irrigation project, seventy-two motor-driven pumps will take water from wells thirty to fifty feet deep, and deliver it to the farms in the surrounding territory. Through their combined efforts many

thousand acres will be made productive. The Western Construction Company, of Wichita, Kan., has the contract for the construction work.

It is expected that the cost of water per foot-acre supplied by the system will be sufficiently low to make it commercially practicable to reclaim hundreds of thousands of acres of similarly arid lands, which have substrata carrying an abundance of water.

### New Electric Iron.

The Phelps Manufacturing Company, of Detroit, Mich., has recently placed on the market an electric iron called the "So-Easy" on account of its simple construction and the ease with which it is operated and maintained.

The iron consists of the fewest possible parts, and these are of the most substantial construction. The heating element is made of a new alloy, and is held in place by one bolt. To remove it it is only necessary to loosen

"SO-EASY" ELECTRIC IRON.

this bolt and insert a new element. This heating element has a high resistance, and is free from iron or other corrosive metals. It is securely clamped between two metal plates and carefully insulated with mica. Between it and the top of the iron there is an air chamber which resists the heat from the top of the iron, and effectively distributes it over the bottom.

The resistance material is applied directly to the smooth surface of the iron causing perfect distribution and the least possible loss of heat due to insulation.

The "So-Easy" iron is made of gray cast iron, very carefully ground, and highly nickel-plated.

A miners' safety oil lamp now being used in England is furnished with a magnetic lock which cannot be unlocked except by a special electromagnetic unlocking machine.

### Improved Shock Absorber.

In the accompanying illustrations are shown two line drawings of a new type of shock absorber which has many commendable features. This device which is being manufactured by the Univer-

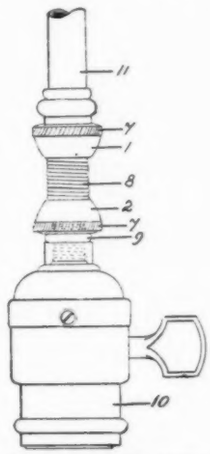



FIG. 1.—LAMP SOCKET WITH SHOCK ABSORBER.

sal Electric Economy Company, Montreal, Canada, is neat, simple and inexpensive and may be used on an angle fixture with equally as good results as on a vertical one.

Referring to the illustrations, Fig. 1 is a view showing a lamp socket connected to a fixture by means of the absorber. Fig. 2 is a vertical section of the device and both, like numerals of reference, indicate corresponding parts in each view.

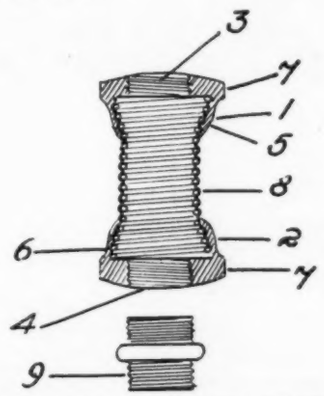



FIG. 2.—SECTION OF SHOCK ABSORBER.

In Figs. 1 and 2 the parts indicated by 1 and 2 are thimbles having the central threaded holes 3 and 4 respectively and the recesses 5 and 6 on the inner sides. In each of the thimbles the wall of the recess converges slightly from the knurled edge 7, so as to make the recess larger at the bed than the opening thereinto.

The weight of the lamp and socket is balanced aginst the tension of a helical spring 8, which flares outwardly at each end and is inclosed in the recesses 5 and 6. As these recesses have walls converging to the opening, the spring is held very rigidly.

The lamp is joined to the shock absorber by means of the union, 9, which is screwed into the threaded hole 4. As shown in Fig. 1 the device is fastened to the fixture by screwing it into the threaded hole of the thimble designated by 1.

It will thus be seen that the lamp is held securely from the fixture by a resilient connection which will prevent any jar to the lamp. The lamp will gently resume its place after any shaking and, in fact, at every motion of the fixture, the spring will avoid any rigidity always due where there is a rigid connection between the lamp and the fixture.

### Kellogg Party Line Bulletin.

Plain facts—what most people want to know about—are sometimes the hardest to find in telephone literature. The average catalogue is an array of glowing statements on what the apparatus will or may do under the most favorable conditions. The "reasons why" are often neglected. There is often too much theory and too little plain discussion of practical points in the work—the kind of questions the "man with the telephone" has to ask about.

To further bring out the fact that Kellogg bulletins are practical, especially with reference to magneto telephone work, the Kellogg company is issuing a return postal folder entitled, "We can show you."

The operators' difficulties with "rubbering in," signaling central secretly, etc., are mentioned in the postal as being explained, with many other features of modern telephone practice, in the Kellogg bulletins, which will be sent promptly on request.

The educational features of Kellogg Party Line bulletin, No. 30, written by H. N. Faris, the Kansas City branch sales manager, a thoroughly practical telephone man, are well known and appreciated by both novice and veteran in the business. The demand for this bulletin has necessitated a second edition, which is now going to press.

**Starting Rheostats for Large Motors.**

Starting rheostats for use with small and medium sized motors are generally designed with a spring-actuated switch arm and a no-voltage release magnet for holding this arm in the running position. The spring tends to return the arm to the "off" position, and prevents the operator leaving part of the starting resistance in the motor circuit; and also returns the switch to the "off" position on failure of voltage, preventing full voltage being thrown on the motor without starting resistance in series, which might cause a burnout of the armature winding.

For large-sized motors, because of the heavy current which must be carried by the rheostat switch and its necessarily larger contact area, the friction between the movable and stationary contacts prevents the use of a spring-actuated arm, and, in addition, if the circuit is opened on the dial switch when carrying a heavy current excessive

STARTING RHEOSTAT FOR LARGE MOTORS.

burning of the switch contacts would result.

In order to meet these conditions the General Electric Company has designed a starting rheostat for large motors, known as the CR-109, which operates as follows: The circuit is opened and closed by means of a contactor with a strong magnetic blowout, and, as the rheostat arm when in the starting position is still connected to the resistance, the circuit is not broken on the dial switch. There are eleven segments, so that the drop of potential between two adjacent segments is too low to cause arcing.

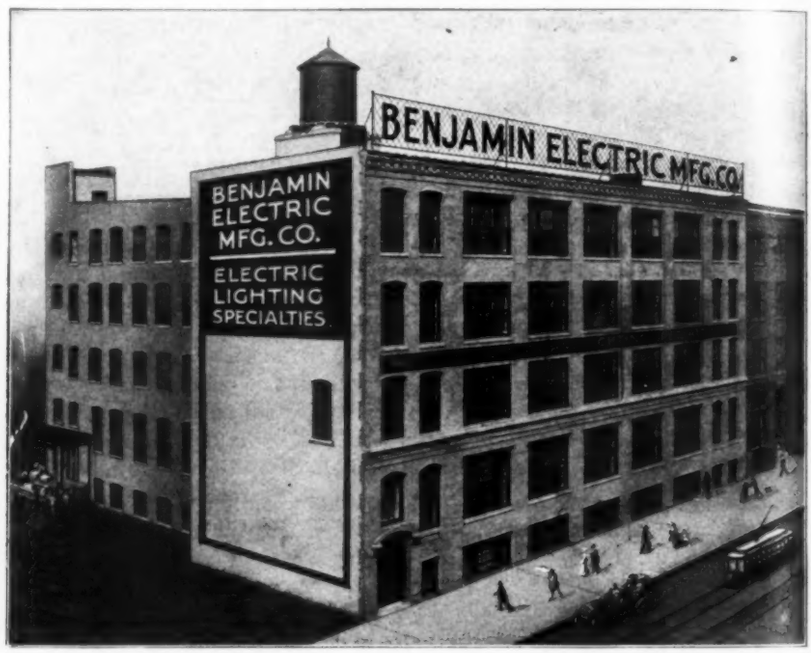
The motor is started by slightly pressing the handle of the rheostat arm to the right when the arm is in the starting position. This energizes the contactor and throws the motor on the line before sufficient pressure is exerted to move the rheostat arm over the contact segments. The rheostat arm is then moved in a clockwise direction until the resistance is all out of the motor circuit.

If the pressure toward the right on the handle of the rheostat arm is relaxed, the contactor instantly opens and disconnects the motor from the line. It is then necessary to return the rheostat arm to the starting position before the contactor can be closed and the motor started. This makes this rheostat strictly fool-proof.

**New Home of the Benjamin Electric Manufacturing Company.**

The increasing demand for the well-known electric lighting specialties manufactured by the Benjamin Electric Manufacturing Company, of Chicago, Ill., made it necessary for the company to look for larger quarters where the constant improvement in its devices could go forward unhampered.

Accordingly, the company arranged for its own building, shown in the accompanying illustration. The building is located at 120-128 South Sangamon Street, very close to the manufacturing district. It consists of four stories and




NEW HOME OF THE BENJAMIN ELECTRIC MANUFACTURING COMPANY.

basement, and each floor occupies 11,000 square feet. Every modern facility for the manufacture of electrical devices is now at the disposal of the Benjamin Company, the officials of which are being congratulated by their many friends for the remarkable success they have attained.

**Egg Preserving by Electricity.**

A new system of treating eggs so as to prevent them from growing stale when in cold storage, has been discovered in Rochester, says the *Scientific American*. This consists in subjecting the eggs to an electrical current. The theory is that eggs when placed in storage are alive and are gradually frozen to death, whereas if the life is destroyed by an electrical current before they are placed in storage they do not taste stale, even when kept on ice for a long period of time.

A smoke-abatement exhibition will be held in Glasgow, Scotland, from September 16 to October 8, inclusive, at which will be demonstrated the various smoke consumers and preventives.

According to L. Vogelstein and Company of New York, the number of tons of copper consumed in Germany during the months of January and February was 28,370, the imports being 29,465 tons, and the exports 1,095 tons.

This compares with 23,019 tons during the same period in 1909. Of the copper consumed in January and February, 1909, 26,563 tons were imported from the United States.

# Current Electrical News

## CONTINENTAL EUROPE.

*(Special Correspondence.)*

PARIS, APRIL 22.—Electric traction lines on the single-phase system are to be shortly installed in the region of Eymoutiers, France, current will be furnished by a turbine plant which is to be built for the purpose. The electric roads on the trolley system will comprise lines to the extent of 200 miles in this reigon, according to the plans which are now drawn up. Single-phase 3,000 volt current is to be used for the overhead trolley wire. At Eymoutiers a hydraulic plant is being built on the Vienne River, where a 160 foot head of water will be obtained by a dam erected at this point. In connection with the power lines there will be built a steam plant at Limoges which will work in parallel with the turbine station. Current will be delivered to the power lines work at 30,000 volts, and a number of substations will reduce this to 10,000 volts for the traction lines.

In Austria there is to be constructed an electric railroad which will run across the frontier into Bavaria. There will be two sections of the line and these are to unite at Garmisch. The first section will run from Innsbruch to Garmisch, pasing by Seefeld, while the second part of the road runs from Garmisch to the Austrian frontier and from thence to Reutte, where it will join the railroad now built from Pfronten to Ulm. The second part of the line runs through a picturesque mountain region and has a number of tunnels and viaducts. Where the line crosses the Loisach there is a viaduct forty feet in height with five arches of forty to sixty foot span.

The fall of the Biayse River, in the Alpine region of France, is utilized for the manufacture of nitrogenous products on the Pauling method. This latter process is applied in an extensive works which is erected at the locality of La Roche. There are now installed in the plant four furnaces for nitrogen production, each having an output of 2,000 horsepower, together with oxidizing towers.

In Austria a concession has been granted for an electric railroad line from Grado to the mouth of the Primero canal at the locality of Bocca di Primero. A railroad will also be built from Gmunden to Borchdorf and current is to be taken from a turbine plant erected at the Traunfall. A part of the current will be supplied from the Walfgang hydraulic plant.

A. DE C.

## EASTERN CANADA.

*(Special Correspondence.)*

OTTAWA, ONT., APRIL 30.—The town of Brockville, Ont., has approved a by-law to raise $50,000 for the improvement of the town lighting plant.

It is thought that the Montreal Light, Heat and Power Company will show close to ten and one-half per cent on the common stock this year which closed to-day.

A semi-anual dividend of $3 per share has been declared on the preferred capital stock of the Cape Breton Electric Company, Cape Breton, Nova Scotia.

The general manager of the Canadian General Electric Company states that the company will spend one million dollars, this year, on the plant at Peterboro, Ont.

A cable advice from Paris, France, states that the application to list the stock of the Quebec Railway, Light and Power Company on that market, has been granted.

The Reese Engineering Company has handed to the city council of Portage La Prairie, Man., an offer to supply the city with electric power at the rate of $20 per horse power in return for an exclusive franchise. A similar contract has been accepted by Brandon, Man.

Work is shortly to be started on the construction of a concrete dam, seventy feet high, across the cascades at St. Alban, Portneuf, Que., where three hydroelectric units will be installed with a capacity of 750 horsepower each. Power will be distributed to eight villages.

The annual report, as presented at the meeting of the Sao Paulo (Prazil) company, at Toronto, this week, showed for 1909 an increase of $152,075, or 6.6 per cent in gross earnings, and an increase of $88,499, or 5.9 per cent in net. The net earnings amounted to $1,592,859. After all payments made the balance carried forward is now $978,866. The directors of the company were voted an extra amount of $10,000 a year for their services. The meeting occupied scarcely half an hour and no changes were made in the directorate, and no intimation was given of any change in the dividend.

As many places in the western districts of the province of Ontario are now desirous of obtaining electric energy from the hydroelectric commission of the province, it is expected that work will soon be commenced on the extension of the transmission line in western Ontario. As lively interest in power transmission is being taken in many western towns, the line will probably be extended to the shores of Lake Huron.

Another power bill—that of the Soulanges Power Company—is before the Quebec legislature and will pass into law in the course of a few days. The head office of the concern will be in Montreal. It is proposed to develop power by the construction of a canal, starting from the St. Lawrence River, at a point above the Soulanges Canal. The powers granted to the company include the sale of electric current and the erection of transmission lines in the city of Montreal, as well as in the counties of Soulanges, Vaudreuil, Jacques Cartier, Hochelaga and Laval. W.

## IMPORTANT DEVELOPMENTS.

*(Special Correspondence.)*

SUWANEE RIVER ELECTRIC PROPERTY TO BE DEVELOPED.—At a stockholders meeting held April 28, 1910, at the office of D. G. Zeigler in Jacksonville, Fla, the Suwanee River Electric Power Company decided to acept an offer for one half interest in this company made by Albert Fendig and others of Brunswick, Georgia, who will pay to the present owners a consideration of $50,000 cash and will also underwrite and dispose of the bonds to secure money to be used for the construction and equipping of the plant. Work will begin at an early date. D. G. Zeigler of Jacksonville and Savannah has charge as consulting engineer and general manager, and is busy making up the final surveys, plans and details and will soon advertise for bids. This development has been under consideration for about two years, but it is of such magnitude that it was impossible to get all details ready to begin construction sooner. It is understood that another meeting will be called for the first week in June at which time it is the intention to elect a new board of directors and officers.

FOR EXTENSIVE CAROLINA TROLLEY SYSTEM.—An interurban trolley system that will connect the cities of the Piedmont section of North and South Carolina from Anderson S. C., to Durham, N. C., and will be built at a cost of approximately $5,000,000 is planned by J. B. Duke, president of the American Tobacco Company and of the Southern Power Company, B. N. Duke and others interested in the latter company, and capitalists of that section. The Dukes propose to furnish the greater part of the capital for the proposed system. Bonds will be issued to the extent of $2,500,000, the Dukes agreeing to place these on the market at not less than par. Of the remaining $2,500,000 necessary, the Dukes agree to take one-half in stock, the remainder, one-fourth of the entire amount required, to be subscribed by manufacturers and capitalists in the cities and towns to be benefited by the operation of the new line. The proposition has been put squarely up to the business men of this section and the subscription of the required amount of stock is assured. The new trolley system will have a mileage of about 250 miles, connecting the cities of Anderson, Greenville and Spartanburg, S. C., Charlotte, Salisburg, Concord, Greensboro and Durham, N. C., with intervening cities and towns of less importance. A fast passenger and freight service will be given on the new line, it being planned to operate trains each way every half-hour. The power will be furnished by the Southern Power Company, which has available at present 100,000 horsepower of electricity, with power sites that will furnish an even larger amount in addition. The Anderson, Greenville & Spartanburg Traction Company, which has already begun work on a system connecting those cities, will be merged into the larger enterprise.

## LIGHTING AND POWER.

*(Special Correspondence.)*

VERNDALE, MINN.—The village lighting plant has been sold H. M. Hicks. C.

DULUTH, MINN.—It is proposed to issue bonds for the installation of a municipal electric lighting plant. C.

OWATONNA, MINN.—Bonds for $50,000 for the installation of a municipal electric lighting plant have been voted. C.

BEACH, N. D.—Geo. H. Chrysler, Wadena, Minn., has accepted the terms of the electric light franchise recently passed by the city. C.

LITTLE FALLS, MINN.—Congress has authorized the Pike Rapids Power Company to construct a dam across the Mississippi river. C.

MINNEAPOLIS, MINN.—The council gas committee ordered

ornamental electric lamps on the steel arch bridge and east channel stone bridge. C.

BARSTOW, CAL.—W. W. Burston, of this city, will add an electric lighting plant to his ice plant. The ice plant is to be moved and rebuilt.

GREENVILLE, TEXAS.—The municipal electric light and power plant that is being erected here will soon be finished. It will cost about $90,000. D.

BEAUFORT, S. C.—It is expected that the electric light plant, which is to be built by the public works commission, will be in operation by November.

BOONE, IOWA.—A twenty-five year franchise has been granted to the Boone Electric Company and it will expend $50,000 in improvements and extensions. C.

GUNTERSVILLE, ALA.—D. C. Jordon is president, J. H Carter vice-president, and Alex. Gilbreath, treasurer, of a company organized here to build an electric light plant. B.

MISSION, TEXAS.—F. Lewis, of San Angelo, Texas, and associates will install an electric light and power plant here. They have purchased a site for the proposed plant. D.

EAST SPENCER, N. C.—An issue of $25,000 bonds for water and lights has been voted by a majority and steps will at once be taken to install these municipal improvements. L.

DE PERE, WIS.—The contract for the gas and electric lighting fixtures for the court house was let to the Moreau Gas Fixture Manufacturing Company, of Cleveland, for $3,000. C.

COLLEGE PARK, GA.—This city (just outside Atlanta) will vote May 30 on issuance of $65,000 of bonds for electric lights, water works and sewers. The mayor can give information. B.

LUCAS, KANS.—The electric light plant was started a short time ago and all the lights are now in operation. Power is supplied to the generators by two Fairbanks-Morse solar oil engines.

CHISHOLM, MINN.—The contract for posts for curb cluster lights was let to Howard Wilson at $20 each and the laying of about 4,500 feet of conduit to the Mesaba Electrical Company for $1,888. C.

FAIRBURN, GA.—This town is thinking of installing electric light system, together with a waterworks, which it is believed can be constructed both together for about $30,000. The mayor can give information. B.

SHEBOYGAN, WIS.—A complete electric lighting plant operated by a gasoline engine has been installed on the dairy farm of Carl Muth, near here. The plant will supply thirty-five twenty-candlepower incandescent lights. M.

QUINCY, CAL.—The Indian Valley Light and Power Company is extending its power lines to farms in the Indian Valley to tap the farms, mines and lumber sections. The local plant will be enlarged and made more modern.

NEW YORK, N. Y.—The Ithaca-Auburn Power Company has been incorporated to manufacture electricity. The capital is $500,000, and the incorporators are: A. H. Flint, New York city; H. A. Clarke, R. L. Post, Cornell Heights, Ithaca.

CUMBERLAND, MD.—The Cacapon Power Company has broken ground for the erection of its new power plant in Crosfield's addition, in Berkeley Springs to be used as an auxiliary to the present large plant now in operation at Great Cacapon.

HOOVERSVILLE, PA.—The Hooversville Light, Heat and Power Company has been granted a state charter. The capital is $12,000 and the incorporators are Calom Fulton, Stoyestown; C. W. Weigle and John J. Bowman, Hooversville.

TRENTON, MO.—The proposition to bond this city for $55,000 for the construction of a municipal light plant was recently defeated at a city election. The city is at present supplied with electricity by the Citizens' Gas and Electric Company.

UNION, ORE.—The hydroelectric plant and the water works system which are being installed are under the direction of L. C. Kelsey, former city engineer of Salt Lake City, Utah. The cost of the combined plants will be approximately $75,000.

INDIANAPOLIS, IND.—The Indianapolis Light and Heat Company has entered upon the work of installing $60,000 worth of new boilers in its new Mill-street plant. The new boilers are only a part of the extensive improvements which the company has under way. S.

BLACK RIVER FALLS, WIS.—The contract for the new power plant has been let to the Minnesota Steel and Machinery Company of Minneapolis, Minn., and the Electrical Engineering Company of Fort Wayne, Ind. A powerhouse will soon be built at a cost of $2,500. C.

GUNTERSVILLE, ALA.—A company has been organized to build an electric lighting plant here to furnish lights to the city and to private consumers. The officers of the company are: D. C. Jordan, president; J. H. Carter, vice-president; Alex Gilbreath, treasurer.

GREENFIELD, MASS.—The Greenfield Electric Light and Power Company which has a plant at Gardner Falls just below the village of Sherburne Falls on the Deerfield River, has bought the Shelburne Falls lighting plant of C. H. Wilcox and E. J. Halligan.

LUFKIN, TEXAS.—The local electric light and power plant of the Lufkin Electric Light and Power Company has passed into the hands of J. P. Starnes, president of the Groveton Light and Ice Company, of Groveton, Texas. He will make improvements to the plant. D.

CARRINGTON, N. D.—A company has been organized, of which F. E. Stanley is engineer, to operate a power plant west of here and supply all towns on the Turtle Lake branch of the Northern Pacific with light and power. The line will probably run to Fargo. C.

WAYCROSS, GA.—The Loomis Syndicate, the new purchasers of the power and light plant continue their improvements. The entire system is to be overhauled and new wiring installed throughout. The various improvements of the syndicate call for an expenditure of $500,000.

DEMING, N. M.—The Deming Ice and Electric Company is adding 400 horsepower to its electrical equipment for the purpose of furnishing additional power for irrigating pumping plants in this section. It has contracted to supply power to the full capacity of its plant, it is stated. D.

MONTOUR FALLS, N. Y.—Work of installing the new street lighting system is well under way and will be finished in a very short time. The Elmira Light and Railroad Company is working in conjunction with the village authorities to make the lighting effective and satisfactory.

JACKSON, GA.—Work is progressing rapidly on the transmission lines to Macon and Atlanta from the Central Georgia Power Company's plant on Ocmulgee River here. A total of forty-five steel towers has been erected while a number more have been assembled ready to be raised. B.

OPELIKA, ALA.—Alabama Electric Light and Power Company, of which C. G. Abercrombie is president, has made a proposition to the city to furnish electric lights for a term of years. This city recently voted bonds for establishment of municipal electric plant. L. F. Dickson is mayor. B.

SENECA, S. C.—The Seneca Light and Power Company has taken out its charter, capital $50,000, and officers have been elected with Campbell Courtney president; L. A. Edwards, secretary and treasurer. The company will sell current for light and power, and has the right to develop water powers. L.

EDWARDSVILLE, ILL.—It is reported that the Sodemann Heat and Power Company's plant here has been secured by a syndicate headed by J. H. McLain, of Canton, Ohio. The new company will probably take charge at once and it is said that they will greatly enlarge the plant in the east end of the city.

EASLEY, S. C.—This city has voted thirty thousand dollars worth of bonds, for water and light systems, after a campaign of several months for the improvements. The committee that will have charge of money realized from the sale of bonds is composed of W. M. Hagood, W. C. Smith and P. M. Taylor.

MILES CITY, MONT.—As a result of the city election Miles City will expend something like $250,000 on improving its electric light, sewer and water systems, all of which are needed. The town has had a phenomenal growth since the advent of the Milwaukee road, and the light, water and sewage systems are insufficient.

CRIVITZ, WIS.—The Crivitz Pulp and Paper Company has under consideration the developing of water power from the Sandstone Rapids near Crivitz to operate the company's pulp mill here. If the proposition is carried through, a new pulp mill will be erected here and electric light will be furnished for the town. M.

CARTHAGE, IND.—F. F. Bremen, a wealthy capitalist of West Virginia, has purchased the property of the Carthage Light, Heat and Power Company and has taken charge. Mr. Bremen announces that he will improve the plant and add considerable new machinery to the powerhouse. The property was recently bought at a receiver's sale. S.

BOURBONNAIS, ILL.—The Illinois Light and Power Company has been given a fifty-year franchise by the Bourbonnais village board. Work is to commence within six months and $100,000 is to be spent the first year and $100,000 the second year. The plant must be capable of generating 5,000 horsepower at the end of four years.

SALT LAKE CITY, UTAH.—Chief Engineer W. H. Bywater, of the Z. C. M. I. is completing the installation of the additional power plant being put in to double the power conveniences of the great institution. The auxiliary power equipment includes a 600 horsepower Corliss engine, connected to a 800-kilowatt electric generator.

PITTSFIELD, MASS.—The Pittsfield Electric Company has awarded the contract for an addition to the Silver Lake plant which will double its capacity. Stone & Webster, of Boston, have the contract, which calls for the installation of a 750-kilowatt generator and boiler. The addition will cost between $125,000 and $150,000.

BOULDER, COLO.—Lightning burned out the transformer at the works of the Central Colorado Power Company at the Neder-

land dam during a recent storm. It damaged nearly all the machinery used in construction and temporarily threw out of employment 300 men. The loss is about $10,000, and the work was delayed about two weeks.

SEVERY, KAN.—The city of Severy will have an election on May 10 to vote upon the proposition of issuing $8,000 in bonds for purpose of building a municipal electric light plant. It is proposed if the bonds carry to go to work at once and erect a suitable plant to light the city with sixty street lights and furnish light to the business houses and residents of the city.

ROSEVILLE, CAL.—There is a move to have the trustees of this city increase the proposed bond issue from $80,000 to $90,000 so as have sufficient funds to install a municipal lighting plant. It is estimated that $10,000 will install an electric light plant that will furnish the city with light and power for many years. The proposition is meeting with general approval.

KERSEY, COL.—A Denver engineer has offered to put in water works and an electric light plant here, at a cost of at least $25,000, and to sell the two plants to the town at the end of ten years, on a fair appraisal. It is proposed to put down deep wells and build a generating plant for electricity, work to start inside of ninety days after the franchise is granted.

LAWRENCEVILLE, GA.—J. B. McCrary Company, Empire Building, Atlanta, Ga., has taken a contract from the city council to furnish electric lights to the city for a term of ten years, beginning January 1, 1911. The McCray company will utilize water-power at Annestown mills on the Yellow River, twelve miles from Lawrenceville, transmitting current to Lawrenceville. B.

SENECA, S. C.—The Seneca Light and Power Company, of Seneca, has been chartered by the secretary of state with a capital of $50,000. The company will manufacture and sell electric lights and electric power and is given the right to develop water power. The officers are Campbell Courtnay, president; G. W. Glenilliat, vice-president, and L. A. Edwards, secretary and treasurer.

BEAUFORT, S. C.—Plans are practically completed for the new municipal electric lighting plant, and bids will be advertised for, first on a basis of material alone, and second, for the completed plant. The commission in charge has determined to superintend the work of building the plant, provided this is determined to be feasible. Bonds for erecting the lighting plant were disposed of in January. L.

MACON, GA.—Louis H. Merrotte, of Montreal, Canada, will have charge of the work of distribution of current from the Central Georgia Power Company. The work is to begin at Griffin, Ga., where the thousands of poles are to be erected and wires strung. It is hoped that work will be completed at that point in three months, as the dam on Ocmulgee River at Jackson, Ga., will be finished by that time.

MADERA, STATE OF CHIHUAHUA, MEXICO.—The Madera Lumber Company which has its headquarters here will install an electric power and lighting plant of 3,200 horsepower at the new town of Pearson in this state where it is erecting two new lumber mills, each of 400,000 feet daily capacity. W. A. Wilkinson of Minneapolis, Minn., has the contract for the construction of the lumber mills. Hiram S. Smith is manager of the Madera Lumber Company. D.

ABERDEEN, S. D.—The Aberdeen Light and Power Company has commenced the work of installing the new cluster lights on North and South Main Street. The lights will extend to Aldrich Park on the north side and to Sixth Avenue southeast on the south side. This takes in all the business houses along Main Street and the light will be extended as the business section grows. The new lights will be ready in a few weeks.

RICHMOND, VA.—The light committee of the council has authorized the superintendent of the department to contract with the Virginia Railway and Power Company for an extension of the present street lighting contract, as the new municipal plants will not be ready to start up for at least four months. The company has offered to supply lights on a basis of $54.75 per year for any fractional part of a year for each street light. L.

SANDUSKY, O.—In a report to the city council, prepared at the request of Mayor George T. Lehrer, the Ahlm-Zorn Engineering Company of Cleveland attempts to show that a municipal lighting plant operated at and in connection with the waterworks pumping station, would in the course of ten years save the taxpayers $100,000. Accordingly the agitation in behalf of municipal ownership as advanced by the mayor, has been renewed.

TONOPAH, NEV.—Material is arriving for the construction of the power plant on Power Mountain Creek, and indications are that this will be one of the best equipped plants in this portion of the West. The constructing company has taken over the holdings of Woodbury, Coin, Gorham and McCone. Power will be transmitted to Aurora, Lucky Boy, and Rawhide. At present all the machinery in Rawhide is driven by gasoline engines.

MADISON, WIS.—The stockholders of the Madison Gas and Electric Company re-elected the following directors at their recent meeting: Alanson P. Lathrop, New York; R. B. Brown, Milwaukee; C. F. Cooley, John Corscot, F. W. Hoyt, John Grinde and A. E. Proudfit, Madison. The directors elected the following officers: President, Alanson P. Lathrop; vice-president, John Croscot; secretary, John St. John; general manager, Frank L. Cross. M.

YORK, PA.—At the annual meeting of the stockholders of the Merchants' Electric Company the following directors were elected: Thomas B. Loucks, Henry Wasbers, William F. Warner, Charles H. Bear, H. K. Lindemuth, all of York; J. Clark Moore, of Philadelphia, and Ralph C. Lupton, of Wilmington, Del. The directors then elected these officers: Charles H. Bear, president; H. H. Lindemuth, vice-president; Clay Krebs, secretary and treasurer. O.

NEW CONCORD, O.—This village is to have a new electric lighting plant, the preliminary plans for the system which were prepared by Samuel S. Wyer having been approved by the village board of affairs. The detailed plans will now be completed and bids will be asked for. The plans provide for a complete electric lighting system with power plant, distribution system, etc. The power plant will be operated by gas engines, operated by gas from producers.

CARTHAGE, IND.—Fred F. Brenen, cashier of the Parkersburg, Marietta & Interurban Railway Company of Parkersburg W. Va., bought the plant of the Light, Heat and Power Company of Carthage, Ind., at the receiver's sale on April 16. Mr. Brenen, who has been in electrical work for a number of years, moved to Carthage on May 1 to take charge of the plant. H. Oran Henley, who has been engineer for over two years and who also was receiver, will continue the work with Mr. Brenen.

COLUMBUS, IND.—The Central Indiana Lighting Company, operating plants in a score of Indiana towns, has filed a supplemental mortgage for $2,500,000 in favor of the Knickerbocker Trust Company of New York. Three years ago the company filed a mortgage for a similar sum to secure the payment of a five per cent bond issue. The supplemental mortgage is given to cover the cost of recent improvements made, including a new powerhouse in this city, which cost upwards of $60,000. S.

CARTERSVILLE, GA.—The Riverside Milling and Power Company has made a proposition to the city to furnish it with water-power for the operation of an electric light plant. It is claimed by parties making this offer that the plan proposed will enable Cartersville to obtain electric current twenty-five per cent cheaper than at present. A committee of five from the city council, headed by Mayor Gilbreath and five citizens outside the council, will investigate this proposition, employing experts, etc., reporting later. B.

CHARLOTTE, N. C.—On account of the growth of the electrical interests of the territory immediately surrounding Charlotte, a movement is being agitated to have an electrical show held in this city some time in the near future, or as soon as provisions therefor can be perfected. It is argued that such a show would tend to vastly increase the use of electricity for all purposes, provided the people can see the practical uses demonstrated to which electricity may be put, and the plan is meeting with general favor so far. L.

COLUMBUS, GA.—Stone & Webster Engineering Corporation has awarded the contract to B. H. Hardaway, Columbus, Ga., for erection of dam across the Chattahoochee River at Goat Rock. The dam will be, when completed, ten feet in height. The present contract calls for about 40,000 yards of masonry, involving an expenditure of some $200,000. Work to be completed by Mr. Hardaway in one year. The complete dam with powerhouse will represent investment of $1,500,000 and will generate 24,000 horsepower. B.

AUGUSTA, ME.—The Consumers' Power Company with a capitalization of $20,000,000, filed a certificate of incorporation at the office of the secretary of state. The company was organized at Portland to manufacture, produce, generate, transmit, distribute and supply electricity for lighting, fuel or other purposes. The common and preferred stock are each placed at $100,000,000, $300 of the capital stock is paid in and the par value of a share is $100. The incorporators are James R. Parsons, William M. Bradley and A. G. McPherson, all of Portland.

CLEVELAND, O.—Contracts for the concrete work and foundations of the new power plant of the Cleveland Electric Illuminating Company at East Seventieth Street has been let and work upon the superstructure will begin early in July. The new station will greatly exceed in capacity the present main plant of the company. Under the present plans the plant will be constructed on the unit system and will have an ultimate capacity of 100,000 kilowatts. The new plant will not replace the present station but will be operated in addition to it.

NORTH ADAMS, MASS.—The Boston & Maine Railroad is improving the ventilation of the Hoosic Tunnel and will install a motor-driven fan. Allis-Chalmers Company is furnishing the electrical apparatus, which will include a 150-kilowatt-ampere, 2,300-volt, three-phase, sixty-cycle, 900-revolution-per-minute synchronous motor to be belted to the fan. Current is received at 6,600 volts and stepped down to 2,300 volts in three fifty-kilovolt-ampere, oil filled, self-cooled transformers. The motor will be started from the alternating-current side through a potential starter.

WADESBORO, N. C.—The deed transferring all the property of the Rockingham Power Company now engaged in the construction of the great hydroelectric plant at Blewett's Falls was

recently filed. This deed transfers to the reorganization committee all of the property of the corporation. The consideration named in the deed is $2,090,000. It is understood that the reorganization committee is now at work on plans by which $2,000,000 can be raisd to complete the plant, the work to be begun immediately. This plant, when completed, will generate 30,000 horsepower.

POYNETTE, WIS.—The farm of J. F. Forrest, near Poynette,, is furnished with a complete electric power plant, from which electricity is obtained for lighting the farm house, grinding the flour, cornmeal, buckwheat and feed needed, and running the cornsheller, grindstone, a drill press and a small rip saw. The source of the power is a power windmill, which drives the dynamo and stores electricity in a storage battery of sufficient capacity to operate the lighting system for about a week. The plant was set up entirely by Mr. Forrest, who installed the battery and did the wiring alone. M.

WILKES-BARRE, PA.—The Wilkes-Barre Gas and Electric Company, the Parson's Electric Light Company, the Anthracite Heat, Light and Power Company and the Wilkes-Barre Heat, Light and Motor Company have all been merged and will be operated under the management of the Susquehanna Railway Light and Power Company. The latter was organized in Connecticut, capitalized at $20,000,000, and controls about twenty different illuminating concerns in various states, including New York, Connecticut, Kansas, Colorado, Indiana and Massachusetts. The company also operates traction lines and heat and power plants.

COLUMBUS, OHIO.—Contracts have been let for the machinery to be installed in the hydroelectric plant which the Coshocton Light and Heating Company is to build at the state dam on the Wahlonding River. The first installation will be two direct connected turbines and generators of 1,400 horsepower capacity. All contracts for machinery have been let and work on the new power house will begin in a short time. The power house will be of reinforced concrete throughout and when it is completed the company will have a capacity of over 2,500 horsepower, the steam plant now developing over 1,100 horsepower.

WAYCROSS, GA.—The Ware County Light and Power Company is enlarging the capacity of its plant. The new equipment will consist of gas-engine-driven alternators with the necessary accessories and will be furnished by Allis-Chalmers Company. It will consist of two 18 by 24-inch single-tandem gas engines each direct-connected to a 250-kilovolt-ampere, three-phase, sixty-cycle, 2,300-volt alternator. A motor generator set and two direct-current generators driven by small gas engines will furnish current for excitation. An induction motor will drive an air compressor which will furnish air for starting purposes. Gas will be supplied by producers.

BELLINGHAM, WASH.—To obtain power for the operation of the proposed Bellingham-Skagit county electric interurban line, Stone & Webster are preparing to double the capacity of the power plant at Nooksack Falls. The efficiency and capacity of the plant will be increased by the installation of a new water wheel at the falls to operate the big dynamo there, and by improving the steam auxiliary plant in this city. In connection with the work to be done at the Nooksack Falls plant, a new substation will be built in this city. The plant will be completed and in operation, says Mr. Shuffleton, during the latter part of the summer and will be used as an auxiliary to the main plant at the falls.

ATLANTA, GA.—The Yellow River Power Company, has been incorporated with $90,000 capital stock by S. H. Venable, S. E. Smith and J. B. McCrary, all of Atlanta and will establish a power plant at Annestown on Yellow River, in Georgia, erecting a concrete dam that will develop 1,500 horsepower. Work is to begin on dam at once as this company has a contract with the city of Lawrenceville to furnish electric current beginning January 1, 1911. Some of the power generated, doubtless will be used in operating granite quarries in which Mr. Venable is largely interested. It is stated that the investment at Annestown will be $150,000. B.

DOUGLAS, WYO.—The North Platte Irrigation Company has let to the Wagner Electric Company, of St. Louis, a contract for the installation of the initial units of a power plant which is to supply electricity to this district. The power house will be located a mile below the North Platte Company's reservoir on the La Perle, and the fall from the reservoir will be used to generate electrical power. The plans for the completed system call for the expenditure on $400,000, and the development of about 6,000 horsepower, but the contract just let covers only a portion of the construction and installation. Electricity from the plant will be supplied to consumers in Douglas and to irrigators along the Platte River for use in pumping water from the river to their lands.

CHARLESTON, SO. CAR.—The Secretary of State of South Carolina at Columbia issued April 19 a commission to Julian Mitchell, P. H. Gadsden and F. H. Horlbeck as incorporators of The Charleston Consolidated Railway and Lighting Company. The initial capital is $2,000,000, of which $500,000 is to be preferred and $1,500,000 common stock. The ultimate capital is given as $4,500,000 of which one and a half million is to be preferred and the remainder common stock. The dividend on all preferred stock is limited to six per cent.

## ELECTRIC RAILWAYS.

*(Special Correspondence.)*

OGDEN CITY, UTAH.—It is stated by an official of the Rapid Transit Company that work will be pushed with all possible speed. Work on the road was commenced a short time ago.

BANGOR, MAINE.—The Bangor Railway and Electric Company will purchase a new freight motor, a new 300-kilowatt generator and turbine set, also a new 1,000-kilowatt generator and turbine set.

WATERVILLE, MAINE.—The Maine Central Railroad Company has recently ordered from the Central Maine Power Company thirteen motors of various sizes, aggregating 325 horsepower, to be used in the company's shops in this city.

GARLAND, MAINE.—The citizens of Garland are agitating the question of an electric railroad to connect this village with the thriving village of Dexter Information can be obtained from L. O. Oaks, L. M. Rideout, E. E. Hill and D. H. Robinson, Garland, Maine.

BOWLING GREEN, OHIO.—The right of way for the new electric line which will parallel the Baltimore and Ohio, has been secured as far as Bloomdale, and the council of that village has granted a franchise. The line will connect the southern part of this county with the county seat. H.

LINCOLN, NEBR.—The Nebraska Traction and Power Company will extend its line from Ralston to Papillion and the work on the extension will begin in the near future. This interurban line now runs from Omaha to Ralston. The information was recentlij given out by C. J. Chapman, traffic manager of the company, who said the work would be rushed to completion as soon as possible.

FREMONT, OHIO.—After spending thousands of dollars in the project to harness the Sandusky River at Ballville, south of this city, it is said that defects have been discovered in the original plans, which has resulted in a temporary suspension of work at the big power plant. The company has recently bought large tracts of land on both sides of the river. It is thought that matters will be straightened out in a short time and the improvement will proceed to rapid completion. H.

HOUSTON, TEXAS.—The Houston & Bay Shore Traction Company has been organized for the purpose of building an interurban electric railway between Houston and a number of resort towns on the shore of Galveston Bay, including La Porte and Seabrook. Considerable progress has been made in the preliminary plans for the construction of the road, it is stated. It will run some distance from the route that is to be followed by the Galveston-Houston Interurban Electric Railway, which is now under construction. D.

TOPEKA, KAN.—The State Charter Board has granted a charter to the Oswego, Columbus & Cherryvale Electric Railway Company with a capital stock of $50,000. This company proposes to build an electric line forty-seven miles long, running through Labette, Cherokee and Montgomery counties. The incorporators of the company are S. B. Miller, of Oswego, D. Christman, W. J. Jones and G. Torbert, of Altamont, David Dunbar, of Hallowell, J. M. Hinds, of Midland Valley, C. A. Mitchell, of Cherryvale, C. S. Huffman, of Columbus, and T. F. Stice, of Oswego.

PIERRE, S. D.—Articles of incorporation have been filed for the Iowa & Dakota Interurban Railroad Company. The company, which has its headquarters at Yankton, is capitalized at $500,000. The board of directors consists of B. E. Wells, R. E. Bamford and H. E. Valentine, of Centerville, L. F. Phillips, W. G. Kirkpatrick and Albert Amundsen, of Lake Andes. The company proposes to build a line from Sioux City to Mitchell, a distance of 125 miles, at an estimated cost of $20,000 a mile. It crosses the counties of Woodbury and Plymouth in Iowa, Union Clay, Turner, Yankton, Hutchinson, Hanson and Davidson in South Dakota.

TRENTON, N. J.—In the United States District Court Judge Reilstab made an order directing Judge Lewis Starr to make a deed of property of the Camden & Trenton Railway Company to Frysinger Evans, Eugene A. Martin and Charles R. Renz, comprising the reorganization committee of the bondholders of the company, who recently bought the property for $675,000. The sum of $75,417 was set aside for the payment of overdue interest and to settle with dissenting bondholders under one classification of bonds, and $37,045 was set aside to make similar settlement with the holders of another class of bonds.

SACRAMENTO, CAL.—Articles of incorporation have been filed by the Elmhurst Street Railway Company, the capital stock of the company being $100,000, of which one-tenth is subscribed. The company proposes to build, own and operate a street and interurban railroad of standard gauge with the usual overhead trolley wire system between the present terminus of the Sacramento Electric, Gas and Railway Company opposite the East Lawn Cemetery and a point at the junction of Manzanita and Helvetia avenues, Elmhurst. The estimated length of the lines of the company as thus planned are less than a mile, but the articles state that branches and extensions are contemplated as fast as traffic will justify and franchises can be secured. The board of directors of the corporation is as follows: H. J. Goethe, H. A. McClelland, C. M. Goethe and G. P. Beere.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

MOTLEY, MINN.—The Motley Telephone Company has been incorporated. Capital $10,000. C.

DRAPER, S. D.—The State Telephone Company has been incorporated with a capital of $5,000.

MINDEN, MO.—The Minden Telephone Company has been incorporated with a capital stock of $5,000.

MERRIMAN, NEB.—The Central Telephone Company has been incorporated with a capital stock of $2,000.

SPALDING, NEB.—The Spalding Telephone Company has been incorporated with a capital stock of $10,000. P.

PETTY MONT.—The county board granted a franchise to Chas. J. Golden to construct a telephone pole line to Tiger Butte. C.

WILBERTON, OKLA.—The Bib Pasture Mutual Telephone Company has been incorporated with a capital stock of $2,500.

WHITEHALL, N. D.—The Montana Independent Telephone Company will shortly commence the construction of the extension of its line to Twin Bridges. C.

WATERVILLE, MINN.—The Dean Electric Company has the contract to install a switchboard in the exchange of the Cannon Valley Telephone Company. C.

COLUMBUS JUNCTION, IOWA—Business men are considering the project of constructing a concrete dam across the Iowa River north of here, to supply power. C.

HILLON, MONT.—The Southern Montana Telephone Company will increase its capital stock from $10,000 to $40,000 for the purpose of making extensions and improvements. C.

DRAPER, S. D.—The State Telephone Company, capital $5,000, has been incorporated by Chas. Parker, J. C. Russell and Elmer Seany to construct a telephone line to Wendt.

RIB FALLS, WIS.—The Marathon County Telephone Company will build two farmers' lines out of here, two out of Marathon and four out of Edgar, at an estimated cost of $1,500. C.

WATERTOWN, WIS.—The Ebenezer Telephone Company has been organized here with a capital stock of $5,000. The incorporators are E. W. Schlutz, Frank Petro and E. F. Wilman. M.

BALDWIN, WIS.—The Baldwin Telephone Exchange has increased its capital stock from $25,000 to $50,000 to make extensive improvements. C.

BUTTE, MONT.—The State Telephone and Telegraph Company has been incorporated by John Steadman and others with a capital of $500,000 to construct telephone, telegraph and electric light lines. C.

LAKE CITY, IOWA—The Central Mutual Telephone Company has commenced the erection of a new exchange building and will change to an underground system. The improvements will entail an expenditure of about $10,000. C.

ROCKLAND, MAINE.—The Knox Telephone Company, S. M. Bird, manager, has announced its intention of laying a cable across Penobscot Bay from Owl's Head to North Haven, at a cost of $28,000, to be in operation by June 1.

KENOSHA, WIS.—An agreement has been made by the Kenosha Gas and Electric Company and the Kenosha Home Telephone Company to use jointly all poles in this place. The entire overhead wire system is to be practically rebuilt. M.

BUFFALO CITY, N. C.—The East Lake Telephone Company, an independent concern located at Buffalo City, Dare county, is being organized to operate a telephone exchange with a capital of $10,000. Those interested are D. M. Strigfield, I. J. Edwards and J. W. Twiford. L.

HUNTERSVILLE, N. C.—The Huntersville Telephone Company has been chartered by the state, with $100,000 authorized capital stock to operate a rural and local telephone system, the same having connection with the Southern Bell exchange at Charlotte, eighteen miles distant. L.

CUMBERLAND, MD.—What is said to be the longest continuous private telephone in West Virginia has just been completed by the Manufacturers' Light and Heat Company, of Pittsburg. It extends from Wheeling to Clarksburg and has connection at the former place with the Washington, Pa., field. Three thousand poles were required in construction.

BAINBRIDGE, GA.—The Sonthern Bell Telephone and Telegraph Company will make various improvements at Bainbridge, including placing of wires in cables. A new copper circuit is to be built from Bainbridge to Thomasville, Ga., and one to Dothan, Ala. Another line is to be built from Bainbridge to Thomasville, Ga., thence to Pensacola, Fla.

CHARLOTTE, N. C.—The Southern Bell Telephone Company of which Jas. Morthey is local manager, will shortly begin the erection of an addition to its present home on Third Street, which will more than double the present capacity, and give this city the largest exchange building in the state. The completed structure will be three stories and will have a frontage of about sixty feet. L.

## ELECTRICAL SECURITIES.

The value of securities fell during the last week, as a result of a combination of circumstances. For some time the influences which made this decline have been held back on account of the proposed raising of United States Steel stock to a five per cent basis. When it was seen that selling of United States Steel increased rather than diminished after the raising of the dividend the speculative tone turned conclusively to the side of depression. The high prices of commodities make the central factor around which the feeling of dissatisfaction gathers.

The $25,000,000 first mortgage due April 1, 1940, by the North Shore Electric to the Illinois Trust Company, has been filed for record.

At the special stockholders' meeting of the Missouri & Kansas Telephone Company, in Kansas City, Mo., it was unanimously voted to authorize an increase in the capital stock from $5,000,000 to $20,000,000.

The following statement on Philadelphia Rapid Transit comes from authoritative sources: The decrease in Philadelphia Rapid Transit gross earnings during the recent strike, which began in the middle of February up to April 25, was about $1,295,000. The increased or extra expenses were about $600,000. For the seven months ended January 31, 1910, the gross earnings were $650,000 ahead of the corresponding period in 1908-1909, so the decrease in gross earnings in ten months of the fiscal year is only about $650,000. It is estimated that the company's operating deficit under fixed charges this year will not exceed $1,000,000 to $1,250,000 at the most. The company has sufficient cash resources to take care of the operating deficit and meet any maturing obligations. The operating deficit last year was $224,290.

The refinancing plan of the Lake Shore Electric Railway Company relative to the preferred stock issues, is now practically assured of going through. Of the two issues of $1,500,000 each, of what was termed old and new stock, which is planned to have exchanged for $1,000,000 six per cent cumulative preferred stock on the basis of one share of first and two shares of second preferred for three shares of the old or new combined or separately, amounting to 30,000 shares in all, there have been deposited and promised for exchange about 27,000 shares.

### DIVIDENDS

American District Telegraph Company, of New York, semi-annual dividend of one per cent, payable May 16.

American Telegraph and Cable Company; quarterly dividend of one and one-fourth per cent, payable June 1.

Electrical Properties Company; regular quarterly dividend of one and one-half per cent on the preferred stock, payable May 10 to stock of record May 2.

Metropolitan Elevated Railroad Company; quarterly dividend of three-fourths of one per cent, payable June 1.

| NEW YORK. | May 2. | April 25. |
|---|---|---|
| Allis-Chalmers common | 9⅞ | 10½ |
| Allis-Chalmers preferred | 34 | 36½ |
| Amalgamated Copper | 67⅛ | 74 |
| American Tel. & Cable | *80 | *80 |
| American Tel. & Tel. | 133½ | 136¼ |
| Brooklyn Rapid Transit | 76 | 80 |
| General Electric | 146 | 150 |
| Interborough-Metropolitan common | 19½ | 22¼ |
| Interborough-Metropolitan preferred | 52 | 58⅝ |
| Kings County Electric | 129 | 130 |
| Mackay Companies (Postal Telegraph and Cables) common | 85 | 88⅞ |
| Mackay Companies (Postal Telegraph and Cables) preferred | 75½ | 76 |
| Manhattan Street Railway | 133 | 135 |
| Metropolitan Street Railway | 18 | 18 |
| U. S. Steel common | 81¼ | 83⅝ |
| U. S. Steel preferred | 117⅝ | 120⅝ |
| Western Union | 67⅜ | 70 |
| Westinghouse common | 62½ | 64¼ |
| Westinghouse preferred | 115 | 115 |

*Last price quoted.

| BOSTON. | May 2. | April 25. |
|---|---|---|
| American Tel. & Tel | 133½ | 136¼ |
| Edison Elec. Illuminating | 248 | 250 |
| General Electric | 146 | 150 |
| Massachusetts Electric common | 17¼ | 18 |
| Massachusetts Electric preferred | 87 | 88 |
| New England Telephone | 133 | 134 |
| Western Tel. & Tel. common | 15 | 15½ |
| Western Tel. & Tel. preferred | 86 | 87 |

| PHILADELPHIA. | May 2. | April 25. |
|---|---|---|
| American Railways | 45 | 45 |
| Electric Company of America | 11⅞ | 11⅞ |
| Electric Storage Battery common | 57½ | 61 |
| Electric Storage Battery preferred | 57½ | 61 |
| Philadelphia Electric | 14⅞ | 15½ |
| Philadelphia Rapid Transit | 15¼ | 19½ |
| Philadelphia Traction | 83 | 86¼ |
| Union Traction | 43 | 48¼ |

| CHICAGO. | May 2. | April 25. |
|---|---|---|
| Chicago Railways, Series 1 | 98 | 98 |
| Chicago Railways, Series 2 | 28½ | 28½ |
| Chicago Subway | 2⅝ | 2⅝ |
| Chicago Telephone | 120 | 120 |
| Commonwealth Edison | 112 | 114 |
| Metropolitan Elevated common | 15 | 15 |
| Metropolitan Elevetade preferred | 54 | 54 |
| National Carbon common | 108 | 110 |
| National Carbon preferred | 116 | 118 |

## LEGAL NOTES.

"PEAK LOAD" BASIS REJECTED.—In the case of Albany Power and Manufacturing Company vs. City of Albany, 65 S. E. R. 886, the plaintiff's petition referred to the highest amount of excess horsepower used as the "peak load," and it was declared that any one "peak load" fixed the basis of payment until another was established. Under this theory it was possible, the supreme court of Georgia says, that in early stages of the contract an emergency might arise by which additional horsepower would be required by the city in double the amount that it would under ordinary circumstances require, and far greater than it might need under any other emergency after that. The maximum quantity thus established would have to be supplied and paid for during the many remaining years of the contract, although the power company might find great difficulty in supplying it, or the municipal necessities might not in any manner demand it. It was hardly probable that the parties intended to lay the foundation for any such unreasonable possible result. But, leaving out of view the possibility of any such result, the court thinks that the language of the contract prevented any construction which supported the theory contended for, the contract providing that the city should pay for 300 horsepower at the rate of $8,000 per annum, and at the same rate and upon the same terms for such additional horsepower as might be furnished to and used by it, it being stipulated that the company should furnish such power in addition to said 300 horsepower, for the full twenty-four hours of each and every day during the life of this contract, as the city might require.

## PERSONAL MENTION.

DR. R. B. OWENS, until recently electrical engineer with the Southern Power Company, Charlotte, N. C., has accepted the appointment of secretary of The Franklin Institute, Philadelphia, Pa. Dr. Owens has had a unique and all-round experience as an electrical engineer. Besides doing much work in connection with the management and operation of central stations, he was for seven years (1891-1898), professor of electrical and steam engineering at the University of Nebraska, and for eleven years (1898-1909) professor of electrical engineering at the McGill University, Montreal, Can. Dr. Owens completely reorganized the engineering teaching methods at this latter institution, for which he received the degrees of B. Sc., M. Sc., and D. Sc. He also holds the degree of M. A. (Columbia) conferred in connection with his epoch-making discovery of the emanation from the rare earths, and was a member of the first class in this country graduated with the degree of E. E. (Columbia, 1891) while still retaining management of a central lighting plant. Dr. Owens has been frequently recognized by being made a member of international electrical congresses and juries, and received a special gold medal and diploma for his services as director of the Electricity and Machinery Building at the Trans-Mississippi Exposition in 1898. He is a fellow of the Royal Society of Canada, a member and past vice-president of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers, a member of the (British) Institution of Mechanical Engineers, a member of the (British) Institution of Electrical Engineers, a member and past president of the Electrical Section of the Canadian Society of Civil Engineers, etc., and has contributed largely to the proceedings of these and other scientific bodies.

WILLIAM PERTAK.

WILLIAM PERTAK has recently become affiliated with the Westinghouse Electric and Manufacturing Company, and will be located at its works, East Pittsburg, Pa. He will be connected with the detail and supply department and will assist in the development of the company's business in heating apparatus; he will specialize in industrial heating appliances. During the last five years Mr. Pertak had been sales manager of the Prometheus Electric Company, New York.

CHARLES R. HUNTLEY, president of the Buffalo General Electric Company, and ex-president of the National Electric Light Association, has been quite ill for several weeks, but is now convalescing. Mr. Huntley made an extended visit to the South early in the year, and while there was attacked by fever and a complication of other ailments that required careful hospital treatment at Johns Hopkins, Baltimore. He is now at his home in Buffalo much improved in health and expects to resume active duties in another month.

PROF. RICHARD ABEGG, one of the most prominent physical chemists of the time, died March 4, from the results of injuries received in a balloon accident. Professor Abegg did a great deal of work in the investigation of cathode rays on certain salts and his theory of electro-affinity marks one of his greatest achievements. He acted as editor of the *Zeitschrift fur Electrochemie* and at the time of his death had edited about half of a handbook of inorganic chemistry.

W. A. SULLIVAN, formerly construction engineer of the Little Rock Railway and Electric Company, of Little Rock, Ark., has been appointed general manager of the electric railway company at Shreveport, La. Mr. Sullivan succeeds L. M. Levison, who has taken a position with the Salt Lake & Ogden Railway Company at Salt Lake City.

J. B. COMSTOCK.

FREDERICK R. MOTT, general superintendent of the Bell Telephone Company of Missouri, has tendered his resignation of that position, to become effective June 15, and F. W. Morris, formerly superintendent of construction, has been appointed to his place, with the title of acting plant superintendent.

J. B. COMSTOCK, for six years with the Westinghouse Electric and Manufacturing Company at its East Pittsburg works, and for four years manager of its publication department and printing plant, severed his connections with that company in April to accept a similar position with the P. & F. Corbin Company of New Britain, Conn. Prior to Mr. Comstock's connection with the Westinghouse Company, he filled the same position with the Corbin Company that he has recently been recalled to assume.

PHIL H. SETZER resigned as manager of the local branch of the Northwestern Telephone Exchange Company, at Mankato, Minn. He will go into the electric light equipment and supply business in that city in partnership with Alderman G. W. Eichstaedt.

HAROLD M. WILSON.

PROFESSOR J. POYNTING has been elected a member of the Athenaeum Club, London, Eng., under the provisions of the rule which empowers the annual election by the committee of nine persons "of distinguished eminence in science, literature, the arts, or for public services."

HAROLD M. WILSON, who for the past seven years has been connected with the sales department of the Prometheus Electric Company, New York, has recently accepted a position with the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. He will be in the detail and supply department and will assist in the development of the company's business in heating apparatus. He will handle both domestic and industrial heating apparatus. For the present Mr. Wilson will be located in the Westinghouse Company's Pittsburg district office.

G. F. GREENWOOD, president of the Mexican Northern Power Company, one of the Canadian concerns operating in the Mexican republic, who has been in that country in the interests of the company for some time past, has returned to Montreal headquarters He reports that development work is progressing in the most satisfactory manner.

## OBITUARY.

ANDREW LEISHMAN GARDINER, assistant counsel of the Interborough Rapid Transit Company, died recently at his home in New York city. Death was due to acute nephritis. Mr. Gardiner was born in Dundee, Canada, in 1858.

GEORGE F. PORTER, sales manager of the Atlantic Insulated Wire and Cable Company, of New York, died very suddenly at eleven o'clock on the evening of April 29, at his residence, 24 Union Street, Montclair, N. J. Mr. Porter was in the office as usual on the twenty-ninth, and was enjoying his usual health. The immediate cause of death was heart failure. A wife and two daughters survive him. Mr. Porter was for many years secretary of the National Electric Light Association, and for the last eight years has been sales manager of the Atlantic Insulated Wire and Cable Company. He was widely and popularly known, and become active in the affairs of the National Electric Light Association on the occasion of the second convention, held in New York in the summer of 1885 at the Union Square Hotel. At that time Mr. Porter was in the carbon manufacturing business and subsequently entered the wire manufacturing business, first with the Kerite Company, and afterwards joining the staff of the Atlantic Company.

## PROPOSALS.

POST OFFICE, FREMONT, NEBR.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until June 6 for the extension, remodeling, etc. (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Fremont, Nebr., in accordance with drawings and specification, copies of which may be had from the custodian at Fremont, Nebr., or at the supervising architect's office.

POST OFFICE, DELAWARE, O.—The office of supervising architect Washington, D. C., will receive sealed bids until May 23, for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Delaware, O., in accordance with drawings and specification copies of which may be obtained from the custodian of site at Delaware, O., or at the supervising architect's office.

SUPPLIES FOR FOREST SERVICE.—The disbursing officer of the Agricultural Department is inviting proposals until May 13 for supplies for the Forest Service Station at Ogden, Utah, on which date the bids will be opened in Washington, as follows:

20,000 standard pony glass insulators, No. 9.
5,000 double-petticoat pony insulators, 12 ounces each.
20,000 [illegible]-inch oak painted brackets.
300 telephone wire No. 12 B. W. G., B. B., galvanized iron.
300 telephone wire, No. 9 B. W. G., B. B., galvanized iron.
1,500 regular 2-point barb wire, 330 pounds to the mile. F.

## NEW PUBLICATIONS.

QUARTERLY OF NATIONAL FIRE PROTECTION ASSOCIATION.—This quarterly publication has in its April issue a very interesting paper on "The Fire Hazard of Flour Mills." The paper was originally written for the guidance of young inspectors in the Ohio Inspection Bureau, and treats the subject quite fully. The article on "Unburnable Homes" gives some idea of the steps which have been taken in this branch of construction. The quarterly contains a number of other papers.

APRIL BULLETIN OF DENVER SECTION OF NATIONAL ELECTRIC LIGHT ASSOCIATION.—The papers reprinted in this bulletin contain a number of interesting points both as to elementary electrical theory and central station practice. H. H. Russell has, in his paper, regarded the series and multiple lighting systems as analagous to two schemes of belting, which he shows by diagrams. The readiness-to-serve rate is explained very simply by R. G. Griswold, who also presented a paper on "Engineering Graduates as Employes."

## EDUCATIONAL NOTES.

SCHOOL OF ENGINEERING OF MILWAUKEE.—The School of Engineering, Milwaukee, Wis., is sending out literature relative to its engineering courses, particularly devoted to the electrical and mechanical engineering courses. The electrical engineering course includes the subjects of direct-current theory, electrical measurements, theory of direct-current dynamos and motors, wiring and electric lighting, alternating-current theory and power plants. As announced in this literature a feature of all of the courses given at this school is the thorough practical training offered to the students in addition to the theory, the school being provided with completely equipped laboratories, shops and drawing rooms.

THOMAS S. CLARKSON MEMORIAL SCHOOL OF TECHNOLOGY.—The Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y., in the April number of its quarterly bulletin, outlines very fully the courses which it offers. As is announced in the bulletin, the student after taking two years of general work chooses the particular engineering course that he wishes to follow. The technical instruction of the last two years, in the theory and practice of engineering, affords the student substantial preparation for immediate usefulness in engineering workshop or laboratory, office or field, by intelligent application of principles to the successful mastery of his field of work.

## NEW INCORPORATIONS.

CHICAGO, ILL.—The Stromberg Electrical Company has been incorporated with a capital of $200,000 to do a general manufacturing and telephone business. The incorporators are Kempster B. Miller, Joseph B. Edwards and Harold G. Rockwell.

JAMESTOWN, N. Y.—The Educational Toy Company has been incorporated to manufacture and deal in electrical machinery, supplies and toys. The capital is $50,000 and the incorporators are C. M. Imus, F. A. Imus Jr., Jamestown, N. Y., and D. Cornen, Warren, Pa.

PORTLAND, ME.—Billmyer & Falk, with Mervyn F. Falk, of New York city, president, and John J. Myer, treasurer, Boston, Mass., was organized for the purpose of manufacturing and dealing in electrical appliances, devices and machinery, with a capital stock of $10,000.

PORTLAND, ME.—The Consolidated Generator Company, with Clarence E. Eaton, president, and T. L. Croteau, treasurer, Portland, Me., was organized at Portland, Me., for the purpose of manufacturing and dealing in electrical devices and apparatus, with a capital stock of $500,000.

WORCESTER, MASS.—The Worcester Electrical Manufacturing Company has been incorporated to manufacture and sell electrical devices. The capital is $300,000, and the officers are: President, J. McGrady; treasurer, J. P. McGrady, Worcester.

CLEVELAND, O.—The B. C. R. Electric Company has been incorporated with a capital of $5,000 to manufacture and deal in electrical machinery and to repair automobiles. G. W. Cottrell, H. E. French, Julius W. Tyler, Gustav Vonden Steinen and Edward A. Kline are the incorporators.

HARTFORD, CONN.—The Standard Electric Fittings Company of Stamford, has filed a certificate of incorporation. It has a capital stock of $20,000 and will manufacture machine fittings. The incorporators are Harry C. Smith, Charles H. Booth, and August B. Church, all of Stamford.

MANHATTAN, N., Y.—The Wappler Electric Manufacturing Company, has been incorporated with a capital of $150,000, to deal in electrical machinery of all kinds and electrical apparatus for surgery. The incorporators are C. B. Stackpole, New York city, W. W. Hoag, New Rochelle, and H. B. McKenzie, Brooklyn.

## INDUSTRIAL ITEMS.

THE ROME WIRE COMPANY, Rome, N. Y., has issued its calendar post card for the month of May. The card advertises "Romeoid" magnet wire, office, and annunciator wire.

THE BRYAN-MARSH COMPANY, Chicago, Ill., is sending out calendars for the present year. The design includes a reproduction of a box labeled "Mazda Lamps from the Bryan-Marsh Co."

THE BENJAMIN ELECTRIC MANUFACTURING COMPANY, Chicago, Ill., announces that it is now permanently located in its new factory and office headquarters, 120-128 South Sangamon Street. All Chicago business will be transacted from these offices.

THE LOCKE INSULATOR MANUFACTURING COMPANY, Victor, N. Y., recently received a large order from the Southern Power Company for suspension insulators of the two-piece design for 100,000 volts. The power company gave this order after having had experience with both the one-piece and two-piece designs.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa, owing to the increased use of electric vehicles in the Central West, and therefore to the increased demand for "Exide" batteries and renewals, has found it necessary to open a store room for "Exide" material at Sixteenth and Pine streets, St. Louis, Mo.

THE WALKER ELECTRIC COMPANY, Philadelphia, Pa., has moved its western branch offices located at Chicago, from the Marquette Building to the Monadnock Block. This company has just published a very interesting bulletin describing the remote-control switchboard equipment installed in the Wanamaker store in Philadelphia

THE DETROIT FUSE AND MANUFACTURING COMPANY, Detroit, Mich., illustrates and describes in its price list No. 16, the "Arkless" fuse, called the "Guaranteed to indicate" kind. The price list contains complete information in condensed form, making it very valuable to fuse purchasers, and will be forwarded on request by the manufacturer.

THE PHOENIX GLASS COMPANY, New York, N. Y., has issued catalogue F., under the title "Phoenix Quality Tungsten Illumination." The catalogue is of standard binder size and is different from the usual glass catalogue in that it has the prices as well as sizes and descriptions.

THE TAUNTON & NEW BEDFORD COPPER COMPANY, Taunton, Mass., manufacturer of switches and switchboards, is building a three-story brick factory 100 by 65 feet. This gives the company about 30,000 more feet of floor space. The factory is being equipped with the most modern automatic machinery and the latest tools for turning out their product.

THE MINNEAPOLIS CEDAR & LUMBER COMPANY, Minneapolis, Minn., recently received an order for approximately 10,000 cedar poles from twenty to forty-five feet in length from the Chicago, Rock Island & Pacific Railway Company. The Minneapolis company produced a good supply of poles of all lengths last winter and these poles are now in good shipping condition.

THE ESTERLINE COMPANY, Lafayette, Ind., is distributing a folder descriptive of the Esterline graphic recorder. Several illustrations give an excellent idea of the appearance of the instrument both externally and internally. A number of points of superiorty are also listed. Esterline graphic records are made in the following types: Switchboard type, wall type, semi-portable type and portable type.

THE GENERAL VEHICLE COMPANY, Long Island City, N. Y., has issued its May number of Elec-Tricks in which are listed some of the advantages of electrics over horse-drawn vehicles. An article entitled "Can the Auto Aid My Business?" which appeared in Leslie's Weekly, is reprinted. The article refers to a number of cases in which the electrically-driven vehicle was used to take the place of horses and wagons.

THE HOLOPHANE COMPANY, Newark, O., in the April issue of Holophane Illumination gives some excellent store-illumination illustrations in connection with an article on "A Typical Depart-

ment Store." Mention is made of a remarkably popular lecture on illumination given by T. F. Godinez in Knoxville, Tenn. An audience of about 1200, an illustration of which is shown on the cover of the booklet, was in attendance.

WESTINGHOUSE CHURCH KERR & COMPANY, New York, N. Y., has recently published the fourth number of their bulletin, "Work Done." The object of the bulletin is to outline the essential principles and activities of the company. More than thirty-five plants are treated, and the work done in each is fully described. The excellent illustrations and the quality of paper and printing combine to make this bulletin an extremely attractive one.

ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has been awarded the contract for the new 6,400-kilovolt-ampere, three-phase, twenty-five-cycle, 4,000-volt steam turbo generator, which is to be installed by the Toledo Railways and Light Company. This will operate in parallel with four Allis-Chalmers engines and two Curtis turbines that form the present equipment of the plant. Ford Bacon and Davis of New York are the engineers for the company.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., has recently published bulletin No. 122, on the subject of the installation of the "Chloride Accumulator" and the "Exide" battery in yachts and power boats. The subject of illumination of yachts for general lighting and decorative purposes is quite fully treated and several illustrations of electrically equipped yachts are shown. The value of having an absolutely reliable source of electricity in a motor boat is also touched upon.

THE HOLOPHANE COMPANY, Newark, Ohio, anounces that on May 1 its New York Branch was moved from its rented quarters at 227-229 Fulton street to the Holophane building at 36 West Thirty-ninth street. The new building has commodious quarters for the branch office, architectural department and export department. There is also an elaborate display and fixture room, demonstration room, etc. For the convenience of the trade the stock room will be maintained at 32-34 Vesey Street at the corner of Church Street.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., has issued a bulletin on electric fan motors for direct and alternating currents. The point is made in the foreword, that fans are no longer considered as a luxury, but as an absolute necessity in the modern office or home. Many illustrations give an excellent idea of the various styles and sizes of the Westinghouse 1910 fans. This bulletin is supplemented by two attractive booklets, one dealing with alternating-current fan motors and the other with direct-current fan-motors.

THE GARWOOD ELECTRIC COMPANY, New York, N. Y., reports having taken a number of orders during the month of April. Among these are three 300-kilowatt 220-volt, direct-current generators, one 150-kilowatt generator, and also thirty-seven and one-half kilowatts in balancer sets. All of this machinery is for the new Whitehall Building, which is said to be the largest office building in the world. The company has also furnished four 150-kilowatt 250-volt generators for the Brewster Company of Long Island City, and several slow-speed motors for ventilating purposes for the Institute of Music, New York city.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has secured the contract for equipping the plant of the Alpha Cement Company at Alsens, N. Y., with electrical apparatus. The equipment will consist of three twenty-four by thirty-six single tandem gas engines each direct connected to a 530 kilovolt-ampere 480 will supply direct current and belted exciters will furnish excitation current. A six panel switchboard of black marine finished marble will hold the controlling apparatus. The air compressor will be driven by vertical gas engine. Cooling water will be circulated by a motor driven pump. Gas for the engines will be supplied by producers.

THE T. M. PARTRIDGE LUMBER COMPANY, Minneapolis, Minn., which has been a producer of cedar poles for the past ten years, reports a gratifying demand for its product. The company has excellent facilities, its land adjoining the Canadian Northern, Great Northern and Northern Pacific railroads in Northern Minnesota and Canada. Fourteen shipping points in Minnesota enables it to make prompt deliveries. The company maintains large concentrating yards at Tenstrike, Mizpah, and Beaudette, Minn., and enjoys favorable freight rates to all points in the United States and Canada. Among its customers are some of the largest consumers in the electric light and power field. It has a large stock of well-seasoned poles of all sizes and is prepared to make prompt deliveries.

THE WESTERN ELECTRIC COMPANY, Chicago, Ill., has recently issued bulletin No. 5500-1, which takes up the design and construction of Hawthorn Solaris multiple direct-current arc lamps. The bulletin is well illustrated with cuts showing the details of the mechanism of the lamps. Bulletin No. 5351 has also been reissued, replacing bulletin No. 5351 of March 1, 1908. This bulletin describes in considerable detail the different types of Hawthorn motor-driven exhaust fans. A complete description of the design and construction of the several types of the fans is included in the bulletin with appropriate illustrations. These fans are especially adapted for use in the ventilating of schoolhouses, public buildings, mines, etc. A section is also given to a description of the small ventilating outfits which may be operated on direct current or alternating current circuits of standard voltage and frequency. These outfits are especially adapted for use in offices, kitchens, dormitories, shops and stores.

### DATES AHEAD.

Southwestern Electrical and Gas Association. Annual meeting, Beaumont, Tex., May 10, 1910.

Ohio Mechanical, Electrical and Steam Engineers' Association. Next meeting, Cincinnati, Ohio, May 10.

Oklahoma Public Utilities Association. Next meeting, Sapulpa, Okla., May 9, 10 and 11.

Pacific Coast Electrical Exposition, San Francisco, Cal., May 21, 1910.

National Electric Light Association. Annual convention, St. Louis, Mo., May 23-28.

Maine Electrical Society. Next meeting, Portland, Me., May 25.

Mississippi Electric Association. Annual convention, Greenville, Miss., June 15 and 16.

American Institute of Electrical Engineers. Annual convention, Waumbeck Hotel, Jefferson N. H., June 27, 28, 29 and 30.

Michigan Electrical Association. Annual convention, Port Huron, Mich., August 16, 17 and 18.

Colorado Electric Light, Power and Railway Association. Next convention, Glenwood Springs, Colo., September 21, 22 and 23.

# RECORD OF ELECTRICAL PATENTS.

**Issued (United States Patent Office) April 26, 1910.**

955,845. IGNITION-TIMER. Herman I. Brodling, Dayton, Ohio. Filed June 11, 1909. An ignition timing device comprises an outer casing having an electrical terminal mounted thereon, an inner rocking head having a contact mounted thereon, a leaf spring brush forming an electrical connection between the terminal on said casing and the contact member on the rocking head, and a rotating shaft having a contact member thereon adapted to engage this rocking head contact during the rotation of the shaft.

955,863. TROLLEY-WHEEL. Burdette B. Gibbs, Minneapolis, Minn. Filed Nov. 21, 1908. The groove of the wheel has two spiral grooves on its sides working down to the bottom of the main groove.

955,899. ELECTRIC ROCK-DRILL. Olin S. Proctor, Denver, Colo. Filed March 2, 1908. An electropneumatic drill.

955,921. TELEPHONE-RECEIVER. Harve R. Stuart and Edwin O. Kizer, Wheeling, W. Va. Filed April 19, 1909. A magnet consists of a complete annulus and an inwardly extending projection therefrom, the poles being located, respectively, in the projection and in the annulus diametrically opposite the projection.

955,923. TELEPHONE. Wilbur H. Thompson, Wheeling, W. Va. Filed March 18, 1909. Serial No. 484,233. A hand telephone comprises a receiver and a transmitter, and a handle therefor composed of tubing and comprising a pliable central member and solid end members secured thereto that are partially compressed to provide flattened portions to which the receiver and transmitter are respectively secured.

955,932. SELF-SUSTAINING ELECTRIC AND HAND POWER ELEVATOR. Thomas Wright, Jersey City, N. J. Filed Jan 12, 1910. Has special remote braking features.

955,984. AUTOMATIC ELECTRIC-GENERATING SYSTEM. Malcolm A. Newstetter, Reading, Pa.; William M. Newstetter, administrator of said Malcolm A. Newstetter, deceased. Filed Nov. 20, 1908. The system includes an explosive engine, an electromagnetic machine, an electric storage battery and means responsive to the condition of the charge of the battery to start and stop the engine.

955,985. AUTOMATIC ELECTRIC-GENERATION SYSTEM. Malcolm A. Newstetter, Reading, Pa.; William M. Newsetter, administrator of said Malcolm A. Newstetter, deceased. Filed May 20, 1909. Similar to the preceding.

956,047. INCANDESCENT-LAMP LOCK. Levi Davis, Alton, Ill. Filed July 31, 1909. A locking ring embraces the socket and engages the bulb.

956,057. AUTOMATIC ELECTRICAL SIGNALING SYSTEM. Howard M. Alfred, Milwaukee, Wis. Filed Nov. 11, 1907. Contacts are made by the intermittent rotation of a drum.

956,066. STARTER AND CIRCUIT FOR VAPOR DEVICES. Stanwood [illegible] Flichtner, Englewood, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed Jan 9, 1905. A plurality of serially operated gas or vapor electric devices are adapted to be started by tilting and a common shunt to the devices includes individual tilting magnets therefor.

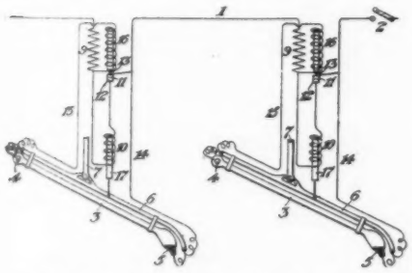
956,109. TRANSMISSION SYSTEM. Otto T. Lademan, Milwaukee, Wis., assignor to Railway Telphone & Electric Company, Chicago, Ill. Filed Dec. 15, 1908. A telephone transmission system.

956,[illegible] CUT-CLOSER. Robert P. Lumley and Henry G. Hillyer, New York, N. Y., assignors to Public Safety Company, Washington, D. C. Filed March 29, 1907. Renewed July 30, 1909. Comprises a casing, a plunger slidable in the casing, a [illegible] on the plunger, contacts with which this bar is adapted to engage, a spring for moving the plunger in one direction, an [illegible] plunger in the casing, and a spring adapted to thrust the auxiliary plunger forward.

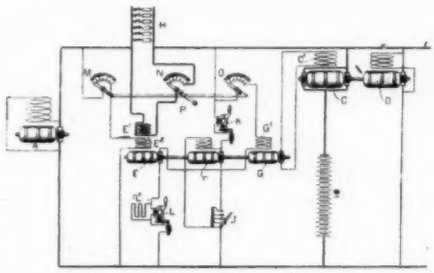
956,[illegible] ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed February 3, 1909. A sliding member is in constant contact with one of two fixed circuit terminals, the other being connected to the fuse case. The sliding member makes and breaks the circuit to the fuse case and may be retained in adjusted position by a locking device.

956,[illegible] SWITCH-BLOCK. Thomas E. Murray, New York, N. Y. Filed Sept. 9, 1909. A switch block for a three-wire system.

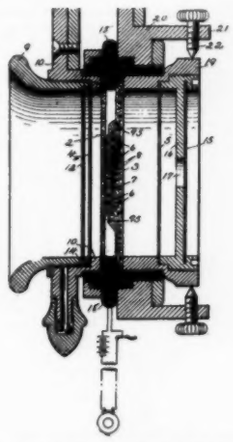
956,[illegible] ELECTRICAL-SWITCH RECEPTACLE. Johann G. Petersen, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Filed Aug. 31 1909. Comprises a cup of insulating material, a switch mechanism located therein, a frame supporting the mechanism, and a cover of insulating material held in place over the opening in the cup by the engagement of a portion with the mechanism supporting frame.



956,066.—STARTER AND CIRCUIT FOR VAPOR DEVICES.



956,353.—ELECTRICAL SYSTEM OF DISTRIBUTION.



956,228.—LONG-DISTANCE TELEPHONIC APPARATUS.

956,164. MAGNETIC CLUTCH. Alfred Pick, Vienna, Austria-Hungary. Filed July 24, 1909. A magnetic clutch comprises a magnet member, means for energizing the member, an armature, and a friction ring hardened upon its friction surface interposed between the member and the armature.

956,165. ELECTRICAL SPACE COMMUNICATION. Greenleaf W. Pickard, Amesbury, Mass. Filed Sept. 3, 1907. Means for conveying intelligence communicated by electromagnetic waves which comprises a local station, a plurality of conductor-stations separated from the local station by various and substantial distances, oscillation-transformers at the local station and at the respective conductor-stations; transmission lines of corresponding lengths connecting the transformers; and load coils in the transmission-lines.

956,168. SYSTEM OF LIGHTING BY GAS OR VAPOR ELECTRIC LAMPS. Henry N. Potter, Pittsburg, Pa., assignor to Cooper Hewitt Electric Company. Filed May 28, 1901. The system comprises a main circuit including a gas or vapor electric lamp and also including the secondary of a transformer, in combination with a heater for the lamp, an interrupter in circuit with the primary of the transformer (the heater, the interrupter and the transformer primary being in shunt to the main lamp circuit) and means for short-circuiting the secondary.

956,171. TELEPHONIC APPARATUS. Thomas C. Rafferty, Philadelphia, Pa. Filed July 24, 1909. A transmitter has magaphones radiating and expanding from the central portion of the diaphragm, and microphonic means coacting with the latter.

956,174. ELECTRIC LAUNDRY-IRON. Earl H. Richardson, Ontario, Cal., assignor to Pacific Electric Heating Company, Ontario, Cal. Filed June 11, 1909. A laundry iron comprises a hollow body, an electric heating element in the body, and a distributing plate bearing against the heating element and making contact with the body at the corner portions only.

956,186. ARMORED ELECTRIC CONDUCTOR. Paul Schroder, Stuttgart, Germany. Filed June 20, 1908. An armored electric conductor comprises interior wires surrounded by insulating material a portion of which has been removed whereby a portion of the wires is bared, metal covered sheaths inclosing said material on each side of the space from which the insulating material is removed, this covering having bent-over side-edges, branch-conductors connected directly with the bared portion of the interior wires, and a clamping strip having bent-over edges interlocking with the bent-over edges of the covering sheaths, and extending across the bared portions and connecting the sheaths.

956,221. MAGNETIC TACHOMETER. John K. Stewart, Chicago, Ill. Filed Nov. 16, 1908. An armature disk is mounted on the case wall and incloses a chamber in which is a coaxial post carrying a rotatable magnet holder. A low-resistance disk is mounted for oscillation on the magnet carrier, the latter being provided with peripheral recesses of horseshoe magnets.

956,228. LONG-DISTANCE TELEPHONE APPARATUS. Victorien Tardieu, Arles, France. Filed November 5, 1904. A telephone system has the transmitter and receiver provided with hollow bodies or chambers arranged close to each other and harmonically proportioned one to the other.

956,229. ELECTRIC FAN. Ralph P. Thompson, Springfield, Ohio. Filed January 23, 1909. A reaction-type electric oscillating fan.

956,245. ELECTRIC-LIGHT HANGER. Orlando M. White and Emory E. Flowers, Alexander, W. Va. Filed July 22, 1909. The lamp is supported by a horizontal bracket and may be lowered by a block and tackle system.

956,250. ELECTRICALLY-OPERATED BELL. Asbury G. Wilson, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed April 3, 1908. A signal bell comprises a casing, a bell suspended within the casing, an electric motor supported in the casing, an arm secured to the motor shaft to rotate within the bell, a lug secured to the inner surface of the bell, and a hammer pivoted to the rotating arm to engage with the lug.

956,251. TELEPHONE APPARATUS. David H. Wilson, Chicago, Ill., assignor to Robert Bines, Chicago, Ill. Filed April 24, 1905. Renewed July 29, 1909. A telephone system comprises a transmitter, a receiver, an induction coil having a plurality of secondary coils, circuit-varying devices for connecting the coils in series when signaling and in multiple when talking.

956,255. SELECTIVE SIGNALING SYSTEM. Max W. Zabel, Chicago, Ill., assignor of one-third to J. G. Ihmsen, Chicago, Ill., and one-third to Oscar M. Leich, Rochester, N. Y. Filed February 11, 1904. A selective system comprises substations and an exchange connected by a metallic line, a polarized selector at each substation, a magneto call signal under the control of each selector, and current-supplying means at the exchange for operating the call signals and at the same time operating the polarized selector, the signal and the selector receiving current from the same electric circuit.

956,265. ELECTRIC-LAMP SOCKET. Vernon T. Bailey, New York, N. Y. Filed July 20, 1909. A base of insulating material has conductor connections at the outer face thereof, and an insulating cover journaled at the center of the base and having caps arranged to move over the connections.

956,288. BURGLAR-ALARM. Samuel Critchfield, National Military Home, Ohio. Filed July 1, 1909. An electric protective system for windows.

956,324. TIMER FOR COMBUSTION-ENGINES. Paul B. Fant, Newark, Ohio. Filed November 29, 1909. Comprises a stationary crucible-shaped support, contacts increasing in width

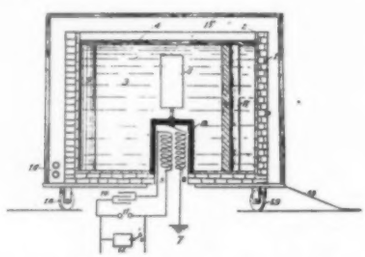
toward the upper ends thereof arranged within the support, a U-shaped support rotatably mounted within the first support, a contact element pivotally mounted on one arm of the U-shaped support, the other arm of the U-shaped support serving as a guide for the contact element, the latter being adapted to be actuated by centrifugal force.

956,353. ELECTRICAL SYSTEM OF DISTRIBUTION. Albert S. Hubbard, Belleville, N. J., assignor to Gould Storage Battery Company. Filed June 13, 1906. The system includes a main generator, a branch circuit thereto, a regulating battery and a booster in the battery circuit of an exciter dynamo for the booster, and a counter-electromotive force machine controlling the current in the field of the exciter and having a field coil in the branch circuit of the main generator.

956,373. COMPOSITE TELEPHONE AND TELEGRAPH SYSTEM. Otto T. Lademann, Milwaukee, Wis., assignor to Railway Telephone and Electric Company, Chicago, Ill. Filed July 23, 1908. A signaling system comprises in combination with a signal-receiving circuit including a make and break contact signal, a battery therefor, and a relay for controlling the association of the signal with the battery, a closed circuit battery, a normally closed circuit therefor and a signal-controlling relay having a weighted vibratory contact for opening when actuated a normally closed circuit including the closed-circuit battery, thus to cause an actuation of the signal.

956,379. ELECTRIC DOOR-OPENER. Joseph Loch, Brooklyn, N. Y. Filed June 22, 1909. A pivoted bolt is electromagnetically actuated.

956,419. PANEL-BOARD. Lyman C. Reed, New Orleans, La. Filed August 9, 1907. A panel board provided with the usual switches and fuses, has, in combination with three busbars, supports for the two outer bars, of a length sufficient to raise the same a distance above the plan of the inner or middle bar to afford a standard insulating space between each of the outer bars and the middle bar.



956,489.—SIGNALING BY ELECTRO-MAGNETIC WAVES.

956,421. ELECTRIC-SWITCH ATTACHMENT. Harry C. Robinson, Coatesville, Pa. Filed August 17, 1909. A movable auxiliary contact is pivoted to one of the main contacts and is capable of engaging a fixed auxiliary contact; and a magnet has means for positively holding the main contacts and the auxiliary contacts in their closed positions.

956,435. CHECK DISPLAYER AND ANNUNCIATOR. William F. Schweiger, Dayton, Ohio, assignor, by mesne assignments, to the National Cash Register Company, Dayton, Ohio. Filed June 25, 1904. In combination with a movable chute having an aperture for the insertion of a check, are means for automatically completely closing the aperture by the movement of the chute after the check has been inserted.

956,461. ARMATURE-CASING. Bert Wheichel, Anderson, Ind. Filed August 6, 1909. An armature casing comprises two members having half boxes constituting bearings, flanges adjacent to the meeting edges of the end walls of the members, and a connecting clamp surrounding the flanges and having a tightening screw.

956,484. TELEPHONE-EXCHANGE SYSTEM. Edward E. Clement, Washington, D. C. Filed March 8, 1905. A register system comprises registers and means for setting the same to identify the lines in the use of the connective circuits, together with means controlled by the subscribers through the telephone lines for determining the final registering or recording acts.

956,489. SIGNALING BY ELECTROMAGNETIC WAVES. Reginald A. Fessenden, Washington, D. C. Filed June 21, 1906. A system for the transmission and receipt of energy by electromagnetic waves comprises an antenna, a surrounding medium of high specific inductive capacity, a reflector therein also arranged in operative relation to the antenna, and a lenticular wall arranged on the side of the antenna opposite the reflector.

956,498. ELECTRIC SAFETY-FUSE. Thomas E. Murray, New York, N. Y. Filed March 11, 1909. The fuse comprises a tubular case integrally formed of fictile material, end plugs of noncombustible material in the case introduced in plastic state and hardened in place by setting, a fuse strip extending between and through the plugs, and a body of non-combustible material completely filling the remaining space within the case and constructed to dampen or retard the vibrations due to sudden shock of explosion, and thereby prevent rupture of the case.

956,502. ATTACHMENT FOR PIANOS AND THE LIKE. Albert D. Palmer, Pittsburg, Pa., assignor of one-half to John Gernert, Pittsburg, Pa. Filed May 14, 1909. An electric playing attachment for pianos.

## PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired May 2, 1910:

496,409. ELECTRIC-ARC LAMP. Frits Hansen, Leipsic-Reudnitz, Germany.

496,449. PERFORATED POLE-PIECE FOR DYNAMO-ELECTRIC MACHINES. Charles E. Scribner and Ernest P. Warner, Chicago, Ill.

496,473. AUTOMATIC RAILROAD-SIGNAL. William Daves, Jersey City and William H. Peddle, Roselle, N. J.

496,474. ELECTRIC BUNCH-LIGHT. Joseph Dillon, Larchmont, N. Y.

496,500. ELECTRICAL MEASURING-INSTRUMENT. Edward Weston, Newark, N. J.

496,513. VIBRATORY TELEGRAPHY. Stephen D. Field, Yonkers, N. J.

496,501. SHUNT FOR ELECTRICAL MEASURING-INSTRUMENTS. Edward Weston, Newark, N. J.

496,513. VIBRATORY TELEGRAPHY. tSephen D. Field, Yonkers, N. Y.

496,514. ARMATURE FOR DYNAMO-ELECTRIC MACHINES. Waldemar Fritsche, Berlin, Germany.

496,517. MANUFACTURE OF ELECTRODES FOR PRIMARY OR SECONDARY BATTERIES. Rudolph T. E. Hensel, Dresden, Germany.

496,522. CONTROLLING AND EQUALIZING ELECTRIC MOTORS. David Mason, Schenectady, N. Y.

493,522. ELECTRIC-DISTRIBUTION SYSTEM FOR RAILWAYS. Nelson W. Perry, Cincinnati, Ohio.

496,455. ELECTRIC-LIGHTING SYSTEM. Elihu Thomson and Edwin W. Rice, Jr., Lynn, Mass.

496,456. COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES. Elihu Thomson, Swampscott, Mass.

496,549. PRINTING-TELEGRAPH INSTRUMENT. Alexander H. Wirsching, Brooklyn, N. Y.

496,550. ELECTRIC LOCOMOTIVE. Eben M. Boynton, West Newbury, Mass.

496,567. UTILIZING ELECTRIC MOTORS FOR OPERATING MACHINERY. Carl Hoffmann and Ernest Richter, Berlin, Germany.

496,591. APPARATUS FOR MAKING BLANKS BY ELECTRICITY. George D. Burton, Boston, Mass.

496,592. WORKING BRASS BY ELECTRICITY. George D. Burton, Boston, Mass.

496,594. ELECTRIC FORGE. George D. Burton, Boston, and Edwin E. Angell, Somerville, Mass.

496,602. ELECTRIC SIGNALING APPARATUS. Stephen D. Field, Yonkers, N. Y.

496,611. AUTOMATIC SAFETY-SWITCH. Adelbert E. Hutchins, Detroit, Mich.

496,618. ELECTRIC GAS-LIGHTER. David J. Quinn, Brookline and Paul W. Hoffmann, Boston, Mass.

496,648.—MAGNET-ARMATURE. Fred L. Gregory, Chicago, Ill.

492,652. INSULATOR FOR TELEGRAPH-WIRES. Ralph G. Hemingray, Covington, Ky., and James C. Gill, Muncie, Ind.

496,658. GALVANIC BATTERY. Frank L. Irving, Brooklyn, N. Y.

496,659. HOT-BOX DETECTOR. Robert C. Kerr and Peter Hardmann, Fall River, Mass.

496,690. ELECTRIC ALARM. Henry F. Kolbe, Detroit, Mich.

496,702. ELECTRIC-ARC LAMP. John F. Sanders and Sarah J. Sanders, Portland, Ore.

496,710. FRICTION-COUPLING FOR DYNAMOS OR MOTORS. Elihu Thomson, Swampscott, Mass.

496,724. BURGLAR AND FIRE ALARM. William C. Dillman, Brooklyn and George A. Seib, New York, N. Y.

496,728. ELECTRIC METER. Joseph Edmondson and Joseph Oulton, Bradford, England.

496,743. ELEMENT FOR GALVANIC BATTERIES. Auguste L. De Meriteus, Paris, France.

496,775. ELECTRIC FORGE. George D. Burton, Boston and Edwin E. Angell, Somverille, Mass.

496,786. ELECTRIC SIGNALING APPARATUS AND SYSTEM. Jacob W. Lattig, Easton, Pa.

496,787. ELECTRIC SIGNAL APPARATUS. Jacob W. Lattig, Easton, Pa.

496,791. ARMATURE ATTACHMENT. William D. Packard, Warren, Ohio.

496,792. ATTACHING DEVICE FOR ELECTRIC-LIGHT FIXTURES. George Peeples, Philadelphia, Pa.

496,801. ELECTRICAL TESTING OUTFIT FOR CABLES, ETC. Edward W. Stevenson, New York, N. Y.

496,807. ELECTRIC CUT-OUT. Augustus Wright, Providence, R. I.

496,808. ELECTRIC SWITCH. Augustus Wright, Providence, R. I.